1973

Library
NOAA, National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396

A UNITED STATES DEPARTMENT OF COMMERCE PUBLICATION

NATIONAL MARINE FISHERIES SERVICE

GRANT-IN-AID FOR FISHERIES Program Activities

1973

U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

U. S. DEPARTMENT OF COMMERCE
Frederick B. Dent, Secretary

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Dr. Robert M. White, Administrator

NATIONAL MARINE FISHERIES SERVICE
Robert W. Schoning, Director

GRANT-IN-AID FOR FISHERIES
PROGRAM ACTIVITIES
1973

Prepared by
Grant-in-Aid Staff
Principal Contributor:
Paul R. Nichols

Washington, D. C.

July 1973

National Oceanic and Atmospheric Administration Circular 71-95, effective October 31, 1971, transferred the functions and staffing of the Division of Federal Aid to the Office of State-Federal Relationships. Thus, the former Division of Federal Aid is now known as Grant-in-Aid for Fisheries Program. Three separate Acts form the legal basis for the program: P.L. 88-309, the Commercial Fisheries Research and Development Act of 1964 as amended; P.L. 89-304, the Anadromous Fish Conservation Act of 1965 as amended; and P.L. 89-720, the Jellyfish Control Act of 1966 as amended.

FOREWORD

Fiscal year 1973 marks the eighth year for the Grant-in-Aid for Fisheries Program administered by the National Marine Fisheries Service. This program has combined resources of the Federal Government, the States, and other non-Federal interests into a coordinated effort to rehabilitate declining fish stocks, and to enhance and develop the fisheries resources of the Nation, as well as the environment that supports them.

The program has greatly increased the research capabilities of the States by making possible the acquisition of adequate laboratories, research vessels, hatcheries, equipment, and personnel so that many fisheries resources can be more effectively managed and conserved. It has also served to stimulate better cooperation among the States, and between the States and the Federal Government, in addressing fisheries problems.

The purpose of this publication is to document and describe all projects funded under the program on a State and subject basis, including a bibliography and other pertinent information. We believe this State-Federal effort has made a valuable contribution by providing for the conservation, management, and development of irreplaceable natural resources in the broad national interest.

Robert H. Stroud

Director
National Marine Fisheries Service

Digitized by the Internet Archive
in 2025

https://archive.org/details/grant-aid-fisheries-program-activities_1973

CONTENTS

	Page
Introduction	1
Administrative Organizations	153
Cooperators	153
National Marine Fisheries Service	156
The Acts	1
Commercial Fisheries Research and Development Act of 1964, Public Law 88-309, as amended	1
Anadromous Fish Conservation Act of 1965, Public Law 89-304, as amended	1
Jellyfish Act of 1966, Public Law 89-720, as amended	1
Apportionment of Federal funds by State and Authorization	2
Expenditures of Federal funds by Activity and Authorization	3
Project titles by State and Public Law with other pertinent information	4
Program Analysis	46
Aquaculture	46
Construction	50
Fish culture facilities	50
Fish landing facilities	51
Fish screens and stream improvement and passage facilities	52
Hatcheries and hatchery facilities	54
Laboratory	57
Research vessel	59
Coordination	60
Disease and parasite control	61
Economics	64
Exploratory fishing and gear development	65
Extension service	68
Fishery products technology	70
Market development	74
Operation and maintenance	76
Planning	77

Page

Research---------- 80
Environment---------- 80
Estuarine---------- 80
Freshwater---------- 83
Marine---------- 86

Finfish (freshwater)---------- 86
Baitfish---------- 86
Buffalofish and carp---------- 87
Channel catfish and bullhead---------- 88
Lake herring---------- 90
Lake trout---------- 90
Paddlefish---------- 91
Rainbow trout---------- 91
Suckers---------- 91
Walleye---------- 91
Whitefish---------- 92
Others---------- 92

Finfish (marine)---------- 94
Alewife and blueback herring---------- 94
American shad---------- 96
Baitfish---------- 97
Groundfish---------- 97
Mackerel---------- 98
Pacific salmon---------- 98
Scup---------- 107
Sea bass---------- 107
Smelt---------- 107
Snapper---------- 107
Steelhead trout---------- 107
Striped bass---------- 108
Sturgeon---------- 109
Tuna---------- 109
Others---------- 109

Jellyfish---------- 111

Marine worms---------- 113

Shellfish---------- 113
Clam---------- 113
Crab---------- 115
Lobster---------- 116
Mussel---------- 117
Oyster---------- 117
Scallop---------- 121
Shrimp---------- 121
Others---------- 123

Resource disaster projects---------- 124

Statistics---------- 125

Publications---------- 129

GRANT-IN-AID FOR FISHERIES
PROGRAM ACTIVITIES 1973

By
Grant-in-Aid Staff

INTRODUCTION

This is the sixth of a series of annual publications on program activities under the Grant-in-Aid for fisheries program of the Office of State-Federal Relationships, National Marine Fisheries Service.

Information presented in this report is intended to provide State program coordinators and administrators, Federal people, project personnel, and others concerned with research, development, conservation, and management of our fishery resources with a convenient reference to this grant-in-aid program. This publication will also facilitate planning, coordination, and integration of State, Federal, and other activities concerned with the fishery resources.

THE ACTS

The Service's Grant-in-Aid Program is authorized under three Acts:

1. The Commercial Fisheries Research and Development Act of 1964 (P.L. 88-309) as amended - Authorizes the Secretary of Commerce to cooperate with the 50 States, the Commonwealth of Puerto Rico, and the Governments of the Virgin Islands, Guam, and American Samoa in carrying out research and development of the Nation's commercial fisheries. Projects eligible for funding include research, development, construction, and coordination. Cost-sharing projects are funded at either a 50 percent or 75 percent level of Federal participation, whereas projects to alleviate resource disaster and for establishment of new commercial fisheries may be financed with 100 percent Federal funds. This Act would have expired June 30, 1973; however, it was extended by Public Law 92-590 for an additional 5 years or to June 30, 1978.

16 Stat 1303 d 10/27/72

2. The Anadromous Fish Act of 1965 (P.L. 89-304) as amended - Authorizes the Secretary of Commerce to enter into cooperative agreements with States and other non-Federal interests for the conservation, development, and enhancement of the anadromous fishery resources of the Nation and the fish in the Great Lakes that ascend streams to spawn. The program is administered at the Federal level jointly by the National Marine Fisheries Service and the Bureau of Sport Fisheries and Wildlife. Federal funds up to 50 percent may be used to finance project costs. State fishery agencies, colleges, universities, private companies, and other non-Federal interests in 31 States bordering the oceans and the Great Lakes may participate under the Act. All projects must be approved by the State fishery agency concerned. This Act would have expired June 30, 1970; however, it was extended by Public Law 91-249 for an additional 4 years or to June 30, 1974. The new law establishes a ceiling of the annual amount that may be appropriated. The total of these amounts for the 4-year period is $32 million. Appropriated funds are available to the program until expended. The new law also provides that the Federal share of the project cost may be increased to a maximum 60 percent when two or more States, having a common interest in any basin, jointly enter into a cooperative agreement with the Secretary.

3. The Jellyfish Act of 1966 (P.L. 89-720) as amended - Authorizes the Secretary of Commerce to cooperate with the States and the Commonwealth of Puerto Rico in controlling and eliminating jellyfish and other such pests in coastal waters. The costs of projects are funded equally by the Federal Government and by the States and Puerto Rico. Coastal States and Puerto Rico that are responsible for the management or administration of fish and shellfish resources or water-based recreation programs may participate under the Act. This Act would have expired June 30, 1973; however, it was extended by Public Law 92-604 for an additional 4 years or to June 30, 1977.

APPORTIONMENT OF FEDERAL FUNDS BY STATE AND AUTHORIZATION

Distribution of Federal funds in the amount of ~~$48,040,764~~ $48,111,764 to the States and others under the National Marine Fisheries Service grant-in-aid for fisheries program in fiscal year 1973 and accumulative totals under each authorization since enactment of the legislation in fiscal year 1966 are given in the following tabulation:

State and others	Fiscal Year 1973			Cumulative total			Grand total
	P.L.88-309	P.L.89-304	P.L.89-720	P.L.88-309	P.L.89-304	P.L.89-720	
Alabama	$ 64,300	$ 36,325	$ 0	$ 524,700	$ 149,525	$ 0	$ 674,225
Alaska	228,000	407,850	0	1,896,000	2,726,200	0	4,622,200
Arizona	19,000	0	0	158,000	0	0	158,000
Arkansas	35,700	0	0	204,800	0	0	204,800
California	228,000	285,000	0	1,896,000	1,950,000	0	3,846,000
Colorado	19,000	0	0	158,000	0	0	158,000
Connecticut	19,000	23,500	0	358,000	122,250	22,370	502,620
Delaware	19,000	1,325	0	214,500	81,325	10,000	305,825
Florida	228,000	10,700	0	2,111,000	106,400	63,560	2,280,960
Georgia	96,300	0	0	789,800	50,500	0	840,300
Hawaii	28,100	0	0	247,500	0	0	247,500
Idaho	19,000	0	0	158,000	0	0	158,000
Illinois	19,000	0	0	170,300	20,500	0	190,800
Indiana	19,000	0	0	158,000	0	0	158,000
Iowa	19,000	0	0	158,000	0	0	158,000
Kansas	19,000	0	0	158,000	0	0	158,000
Kentucky	19,000	0	0	158,000	0	0	158,000
Louisiana	228,000	0	0	2,172,388	85,000	0	2,257,388
Maine	172,800	44,000	0	1,513,700	220,400	0	1,734,100
Maryland	153,900	64,000	50,000	1,339,400	410,800	238,000	1,988,200
Massachusetts	228,000	23,000	0	2,096,000	131,000	0	2,227,000
Michigan	19,000	35,000	0	628,900	200,000	0	828,900
Minnesota	19,000	0	0	158,000	23,000	0	181,000
Mississippi	91,100	17,500	19,000	942,700	120,000	99,256	1,161,956
Missouri	23,300	0	0	168,500	0	0	168,500
Montana	19,000	0	0	158,000	0	0	158,000
Nebraska	19,000	0	0	158,000	0	0	158,000
Nevada	19,000	0	0	158,000	0	0	158,000
New Hampshire	29,900	~~458,000~~ ~~450,000~~	0	170,300	~~550,000~~ ~~450,000~~	0	~~758,200~~ ~~750,200~~
New Jersey	99,000	15,000	0	1,108,600	117,500	0	1,226,100
New Mexico	19,000	0	0	158,000	0	0	158,000
New York	156,600	0	0	1,338,100	99,000	61,395	1,498,495
North Carolina	51,100	45,000	3,500	530,500	292,125	17,500	840,125
North Dakota	19,000	0	0	158,000	0	0	158,000
Ohio	41,400	0	0	394,000	95,500	0	489,500
Oklahoma	19,000	0	0	158,000	0	0	158,000
Oregon	135,800	344,950	0	1,036,800	2,436,875	0	3,473,675
Pennsylvania	81,900	750	0	484,900	73,250	0	558,150
Rhode Island	28,300	20,000	0	204,500	125,000	0	329,500
South Carolina	36,200	20,500	0	246,500	108,000	0	354,500
South Dakota	19,000	0	0	158,000	0	0	158,000
Tennessee	19,000	0	0	158,000	0	0	158,000
Texas	228,000	0	0	1,901,568	0	0	1,901,568
Utah	19,000	0	0	158,000	0	0	158,000
Vermont	19,000	0	0	158,000	0	0	158,000
Virginia	120,600	90,000	0	1,322,344	553,000	266,607	2,141,951
Washington	151,200	394,600	0	1,508,200	2,769,150	0	4,277,350
West Virginia	19,000	0	0	158,000	0	0	158,000
Wisconsin	22,900	21,000	0	164,400	125,700	0	290,100
Wyoming	19,000	0	0	158,000	0	0	158,000
American Samoa	89,600	0	0	604,500	0	0	604,500
Guam	19,000	0	0	158,000	0	0	158,000
Puerto Rico	228,000	0	0	1,783,600	0	42,076	1,825,676
Virgin Islands	19,000	0	0	158,000	0	0	158,000
TOTAL	$3,800,000	~~$2,350,000~~ $2,356,000	$ 72,500	$33,549,000	~~$13,642,000~~ $13,742,000	$ 820,764	~~$48,011,764~~ $48,111,764

EXPENDITURES OF FEDERAL FUNDS BY ACTIVITY AND AUTHORIZATION

Program activities cover various fields, including a broad category of research, construction, development, coordination, and resource disasters. Fifty-four percent of the Federal funds are used for research in such areas as fish disease and parasite control, aquaculture, the environment, basic biology, and life history. Seventeen percent for construction of research vessels and laboratories, fish hatcheries, fish screens, and other fish facilities. Eighteen percent on exploratory fishing, gear development, fish products, economics, and other development projects. Seven percent on coordination and planning. Four percent for resource disasters.

Activity	Public Laws			Subtotal	
	88-309 ($1,000)	89-304 ($1,000)	89-720 ($1,000)	Dollars ($1,000)	Percent (Total)
Construction				8,112	16.9
Fish culture facilities	112				
Fish landing facilities	322				
Fish screens	0	1,747			
Stream improvement	21	599			
Hatcheries	144	3,248			
Laboratory	1,517	72			
Research vessel	330				
Coordination	1,547	214		1,761	3.6
Development				8,584	17.9
Economics	100				
Exploratory fishing	1,652	150			
Extension	985				
Fishery products	1,138				
Marketing	2,902				
Operation & maintenance	113	469			
Statistics	979	96			
Planning	1,472	194		1,666	3.5
Research				25,968	54.0
Aquaculture	1,821	20			
Disease & parasites	1,155	180			
Environment	2,001	108			
Finfish	6,691	6,555			
Jellyfish			840		
Marine worms	216				
Shellfish	6,381				
Resource disaster	1,950			1,950	4.1
TOTAL	33,549	13,652	840	48,041	100.0

PROJECT TITLES BY STATE AND PUBLIC LAW
WITH OTHER PERTINENT INFORMATION

All 50 States, the Commonwealth of Puerto Rico, and the Governments of American Samoa, Guam, and the Virgin Islands are participating in the program under one or more of the authorizations. Since the start of the program, 721 projects have been initiated at an estimated total cost (both State and Federal) of more than $82 million. Of the projects initiated, 563 have been completed at a total cost of more than $56 million, and 158 are continuing at various stages of completion at an estimated total cost of nearly $26 million. The average Federal share of project cost is about 67 percent.

Tabulation of completed and continuing projects, including total cost, follows:

Public Law	Completed projects		Continued projects		Total projects	
	Number	Total cost	Number	Total cost	Number	Total cost
88-309	403	$32,991,500	118	$15,778,900	521	$48,770,400
89-304	148	21,341,000	40	10,054,900	188	31,395,900
89-720	12	1,859,800	0	0	12	1,859,800
TOTAL	563	$56,192,300	158	$25,833,800	721	$82,026,100

A list of projects under each authorization by State, including duration, date completed, and page reference for project narrative, is tabulated pages 5 through 45. Under Public Law 88-309, project numbers identify the Region administering the project by the first digit, project number sequence within the Region by next digit(s), followed by a letter to denote activity as R-research, C-construction, D-development, and S-coordination and planning, and 4(b) when funded with resource disaster funds. Under Public Law 89-304, the first two letters "AF" identify the project as anadromous fish, with next letter "C" for projects administered by NMFS, or "CS" for jointly funded projects with BSF&W with NMFS as lead agency, and "SC" for jointly funded projects with BSF&W as lead agency, followed by number sequence within each State. Under Public Law 89-720, the first two letters "JF" identify the project as jellyfish, followed by the number of the Region administering the project and number sequence within that Region.

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	ALABAMA					
88-309	2-18-R. Oyster raft production	1966	3	25,430	1968	117
	2-29-C. Construction of public oyster landing facilities	1966	1	13,000	1967	51
	2-30-D. Shell planting for oyster cultch	1966	1	18,100	1967	117
	2-31-C. Oyster rearing pond construction	1966	2	7,560	1968	50
	2-34-R. Cooperative Gulf of Mexico estuarine inventory - Alabama	1966	4	214,710	1970	77
	2-58-D. Gulf of Mexico estuarine film	1967	2	7,900	1969	68
	2-64-D(4b). Restoration of Alabama's supply of seed oysters	1968	1	45,000	1969	124
	2-83-R. Survey of the live bait-shrimp industry in Alabama	1969	1	3,990	1970	97
	2-86-R. Experiments in the culture of marine species in floating baskets	1969	4	92,200	1973	46
	2-102-D(4b). Restoration of Alabama's public oyster reefs damaged by Hurricane Camille	1969	1	20,000	1970	124
	2-119-R. A survey of the benthic organisms in coastal streams and brackish waters of Alabama	1970	1	12,100	1971	80
	2-120-R. Distribution of commercial fishes and invertebrates in the tidal rivers of Alabama	1970	3	50,000	1973	109
	2-141-R. Publication and reproduction of research reports	1971	3	34,000		68
	2-143-R. Evaluation and planning of Alabama's marine resources research and development requirements	1971	1	7,830	1971	77
	2-149-R. The circulation and tidal flushing of Alabama's estuaries and the effect of shell dredging on suspended solids	1971	2	61,000	1973	80
	2-165-D(4b). Restoration of an oyster resource destroyed by natural causes	1972	1	70,000	1972	124
	2-201-R. Study of oyster reef cultivation and artificially inducing crab molting	1973	1	25,000		123
89-304	AFC-1. Research on striped bass, Roccus saxatilis, in Alabama rivers	1967	3	70,000	1970	108

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	AFC-3. Striped bass, Morone saxatilis, production to establish commercial stocks in Alabama estuaries	1970	3	79,600	1973	108
	AFCS-5. Construction of an anadromous fish hatchery and rearing facility	1971	3	232,900		54
	AFCS-6. Striped bass production and stocking experiments in Alabama coastal areas	1973	3	120,000		108
	AFC-4,7. Factors limiting the survival and growth of early life history stage of the striped bass (Roccus saxatilis)	1970	6	108,000		108
	ALASKA					
88-309	5-3-D. Expansion of current and development of additional commercial fisheries catch, production, and gear statistics	1966	4	43,800	1969	125
	5-4-R. Pink salmon forecast research	1966	4	302,825	1969	98
	5-5-R. Kvichak River smolt study	1966	4	130,200	1969	99
	5-6-R. Cook Inlet sockeye salmon investigations	1966	4	206,000	1969	99
	5-7-R. Investigations of factors limiting the production of introduced sockeye in lakes	1966	2	49,400	1968	99
	5-8-R. Monitoring the effects of land use on salmon production	1966	4	73,300	1969	83
	5-9-R. Investigation of ecological factors limiting production of the Alaska pandalid shrimp (See 5-20,25-R)	1966	4	122,700	1969	121
	5-11-R. Reproduction of king crab (Paralithodes camtschatica) in the Kodiak Island area	1966	4	181,300	1969	115
	5-12-C. King salmon headquarters architectural plans	1967	1	15,000	1967	77
	5-13-D. Commercial feasibility of Alaskan scallop fishery	1968	1	40,000	1968	121
	5-14-R. Southeastern and Kodiak Island, Alaska, stream catalogs	1968	1	4,000	1968	77
	5-17-R. Pink salmon studies	1969	2	116,500	1971	99
	5-18-R. Sockeye salmon investigations	1969	2	107,700	1971	99
	5-19-R. Effects of land use in salmon production	1969	1	20,800	1970	83

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	5-21-R. Dungeness crab research	1969	1	309,500	1970	115
	5-23-R. Sea scallop investigations	1969	3	99,000	1972	121
	5-20,25-R. Pandalid shrimp studies	1969	4	313,300		121
	5-1,15,26-S. Coordination and planning	1966	8	291,600		60
	5-16,27-D. Alaska commercial fishery statistics	1969	4	97,400		126
	5-24,28-R. Relationship between logging activities and salmon production	1970	3	179,600		83
	5-29-R. Cook Inlet shellfish investigations	1972	1	28,100		121
	5-22,30-R. King crab study	1969	3	202,300		115
89-304	AFC-2. Sockeye salmon migration behavior and biological statistics collection, Southeastern Alaska	1967	4	202,000	1970	99
	AFC-3. Restoration and rehabilitation of earthquake-damaged pink and chum salmon spawning areas in Prince William Sound	1967	4	342,400	1970	84
	AFC-4. Offshore salmon abundance index	1967	4	496,000	1970	99
	AFC-6. Bristol Bay intermediate high-seas inshore test fishing program	1967	4	218,400	1970	99
	AFC-7. Arctic-Yukon-Kuskokwim River anadromous fish investigations	1967	4	322,800	1970	100
	AFC-8. Kodiak Island sockeye salmon investigations	1967	4	423,600	1970	100
	AFC-9. Identification of red salmon stocks taken in the Cape Kumlik-Aniakchak Bay fishery (Chignik area)	1967	1	40,000	1968	100
	AFC-10. Copper River sockeye salmon investigations	1967	4	295,800	1970	100
	AFC-12. Forecast of Kodiak Island pink salmon runs from abundance of juveniles in estuaries	1967	1	44,400	1968	100
	AFC-13. Optimum escapement studies of Chignik sockeye salmon	1967	1	33,700	1968	100
	AFC-14. Pink salmon forecast research	1968	3	105,400	1970	100
	AFC-15. Computer simulation model of the Dixon Entrance salmon stocks	1968	2	36,000	1969	100
	AFC-16. Escapement enumeration investigations	1968	3	132,800	1970	100

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	AFC-17. Optimum escapement studies of Chignik sockeye salmon	1968	1	33,700	1969	101
	AFC-20. Studies of juvenile sockeye salmon in Iliamna Lake and Lake Clark	1969	1	40,000	1970	101
	AFC-21. Kvichak River smolt study	1969	1	58,700	1970	101
	AFC-22. Optimum escapement studies of Chignik sockeye	1969	1	33,700	1970	101
	AFC-24. Offshore test fishing - Southeastern Alaska	1970	1	107,800	1971	101
	AFC-25. Sonic assessment of salmon escapements	1970	1	4,000	1971	101
	AFC-26. Yukon River anadromous fish investigations	1970	3	318,000		101
	AFC-27. Kodiak sockeye rehabilitation	1970	2	212,000	1972	101
	AFC-28. Alaska Peninsula pink salmon forecast	1970	3	111,300		101
	AFC-29. Sockeye salmon studies, Southeastern Alaska	1970	1	62,800	1971	102
	AFC-30. Stream rehabilitation, Prince William Sound	1970	3	438,900		84
	AFC-31. Bristol Bay test fishing program	1970	3	114,800		102
	AFC-32. Identification and enumeration of Copper River sockeye salmon stocks	1970	3	318,000	1972	102
	AFC-33. Sockeye smolt enumeration study	1970	2	147,200	1972	102
	AFC-34. Species interrelationships in Chignik Lakes	1970	3	101,100		102
	AFC-35. Carrying capacity of the sockeye salmon nursery areas in the Kvichak district, Bristol Bay, Alaska	1970	1	50,000	1971	102
	AFC-11,36. Coordination and planning	1967	7	462,800		60
	AFC-40. Southeastern Alaska sockeye salmon optimum escapement studies	1971	3	208,800		102
	AFC-41. Cook Inlet sockeye forecast and optimum escapement studies	1971	3	364,000		102
	AFC-42. Alevin abundance - pink salmon prediction studies	1971	3	450,000		102

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	AFC-43. Norton Sound anadromous fish investigations	1972	2	48,000		103
	AFC-44. Systems modeling of sockeye salmon in the Wood River Lakes	1972	3	38,000		103
	AMERICAN SAMOA					
88-309	H-8-D. A determination of the feasibility of developing offshore commercial fishing in American Samoa	1966	3	222,537	1969	65
	H-15-D. Development of pole and line skipjack tuna fishery in American Samoa	1970	3	242,250	1972	65
	H-16-C. Acquisition of multi-purpose research vessel	1970	1	85,000	1971	59
	H-17-D. Acquisition of a prototype demonstration fishing vessel for American Samoa	1970	1	10,000	1972	59
	H-18-D. Statistical analysis of American Samoa's fisheries	1971	3	28,000	1972	126
	4-21-D. Development of natural and captive baitfish stocks	1972	3	75,000		97
	4-22-D. Further studies of the nearshore tuna resources of American Samoa	1972	3	365,000		109
	ARIZONA					
88-309	6-1-R. Investigation of commercial fishery potentials in reservoirs	1966	3	28,510	1969	87
	6-11-R. Commercial fisheries potential of reservoirs	1969	3	76,240	1972	87
	4-19-R. Influence of pump storage and generation on commercial fisheries potential of reservoirs	1972	3	74,211		84
	ARKANSAS					
88-309	4-12-D. Commercial fisheries industry survey	1966	5	49,060	1971	77
	4-49-R. Rearing single and multiple species populations of catfishes in cages	1969	2	28,000	1971	46
	4-53-R. Influence of temperature and photoperiod on growth, food consumption, and food conversion efficiency of blue catfish, Ictalurus furcatus (Lesueur)	1969	2	28,000	1971	88
	4-67-D. Cage culture of fish in reservoirs	1970	1	21,420	1971	46

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	2-133-R. Culturing of trout in cages	1970	1	5,400	1971	46
	2-148-R. Efficacy of prophylactic treatments on caged catfish and investigations of cage construction material	1971	1	12,820	1972	46
	2-157-D. Commercial fishery industry survey	1971	3	43,500		126
	2-162-R. Effects of quality and quantity of food on golden shiner production	1971	3	50,000		86
	2-166-R. Effects of cage culture fish production upon the biotic and abiotic environment of Crystal Lake	1971	3	81,900		84
	CALIFORNIA					
88-309	6-3-R. Fisheries resources sea survey	1966	8	1,269,000		109
	6-4-R. Shellfish laboratory operations	1966	6	738,300	1972	46
	6-6-D. Port sampling at Crescent City	1966	4	23,644	1969	126
	6-8-D. California shellfish and bottomfish data analysis	1966	4	236,000	1970	126
	6-12-C. Shellfish laboratory - water construction and electrical power installation	1970	1	32,000	1971	50
	6-12-D. Shellfish and bottomfish data analysis	1970	3	255,000	1973	126
	6-5,16-S. Coordination of Public Law 88-309	1966	8	197,000		60
	6-7,16-R. Food habits study of organisms of the California current system	1966	4	143,300	1971	110
	4-20-R. Mariculture research and development	1972	3	284,400		47
89-304	AFSC-1. Mad River hatchery construction	1967	4	2,684,250	1972	54
	AFC-3. Mad River hatchery fish ladder construction	1967	4	40,000	1971	54
	AFC-6. Scott Valley fish screen construction	1967	1	70,000	1967	52
	AFC-7. Anadromous fish water requirements	1967	2	147,000	1968	84
	AFC-8. Delta migration study	1967	1	72,000	1968	103
	AFC-9. Banta-Carbona fish screen construction	1968	3	225,000	1971	52

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	AFSC-10. Glenn-Colusa fish screen construction	1968	4	2,540,000	1973	52
	AFC-11. El Solyo fish screen	1970	1	90,000	1971	52
	AFC-12. Ocean salmon study	1972	5	489,800		103
	AFSC-15. Mad River fish hatchery operations	1972	3	888,800		76
	COLORADO					
88-309	6-2-D. Raising bait fishes in the Rocky Mountain States	1966	5	178,000	1971	87
	6-11-D. Culture of fishes with commercial importance	1970	3	87,000	1973	47
	CONNECTICUT					
88-309	3-33-S. Coordination and planning	1966	3	7,100	1968	60
	3-44-R. Investigations on the lobster	1966	4	99,836	1970	116
	3-45-R. Investigations of the life histories and potential fishery of river herrings	1966	3	42,100	1968	94
	3-51-D(4b). Disaster relief, Connecticut oyster fishery	1966	1	200,000	1967	124
	3-130-R. Ecology, population structure, and movements of lobster	1970	3	74,400	1973	116
89-304	AFC-1. A study of the rate and pattern of shad migration in the Connecticut River--utilizing sonic tracking apparatus	1968	3	43,000	1970	96
	AFC-3. Investigation of the life histories and potential fishery of river herrings in Connecticut	1967	3	43,000	1970	94
	AFC-6. A study of the migratory behavior of American shad	1970	3	66,000		96
	AFC-7. Estimating the number of river herring in the Connecticut River	1970	3	53,200		94
	AFC-8. A study of the weight loss in American shad during the freshwater migration	1972	3	27,000		96
89-720	JF-3-6. Studies directed toward methods for control of Codium fragile in Long Island Sound	1970	3	49,126	1973	111
	DELAWARE					
88-309	3-8-D. Rehabilitation of the natural seed oyster beds in Delaware	1965	1	40,000	1966	118

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	3-49-R. Pilot studies of the spawning and rearing of MSX-resistant oysters	1967	3	127,800	1970	61
	3-49-R(4b). Pilot studies of the spawning and rearing of MSX-resistant oysters	1966	1	29,000	1967	124
	3-55-R. A resurvey of the condition and extent of the natural seed oyster beds in Delaware	1967	1	12,000	1968	118
	3-98-D. An experimental planting of seed oysters in Delaware Bay	1969	1	3,600	1969	118
	3-135-R. Hard clam survey of Delaware Bay	1970	3	60,000	1973	113
	3-142-R. Live oyster bed and cultch survey of Delaware Bay and tributaries	1971	3	54,000		118
89-304	AFCS-1. Feasibility of the restoration of shad runs in the tributaries of the Delaware estuary	1967	1	20,000	1968	96
	AFSC-3. Shad passageway construction on the Brandywine River	1968	4	120,000	1972	52
	AFSC-4. Restoration of shad runs in the Brandywine Creek and its tributaries	1971	5	177,825		52
	FLORIDA					
88-309	2-11-D. Marketing of seafoods	1965	4	1,345,780	1970	74
	2-50-D. Gulf of Mexico estuarine film	1967	2	7,900	1969	68
	2-52-D. Construction of artificial oyster reefs	1967	4	175,090	1971	118
	2-53-R. A study of the effects of a commercial hydraulic clam dredge on benthic communities in estuarine areas	1967	3	86,720	1970	80
	2-81-R(4b). Cooperative blue crab study - South Atlantic States	1969	1	15,000	1970	124
	2-113-R. Development of specialized mariculture techniques on species of high potential	1970	3	182,000		47
	2-125-D. Fisheries marketing and extension service	1970	1	213,100	1971	74
	2-126-D. Fisheries technical assistance	1970	1	34,870	1971	68
	2-134-R. Exploratory clam survey of estuarine and nearshore waters of Florida	1970	2	118,100	1972	113
	2-150-D. Artificial oyster reef development	1971	3	150,000		118

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	2-152-D. Fisheries extension service (home economics)	1971	1	141,577	1972	68
	2-167-D(4b). Reestablishment of destroyed oyster reefs	1972	1	200,000	1973	125
	2-177-D. National molluscan film	1972	1	4,000		68
	2-185-R. Rock shrimp life history studies and exploratory fishing survey	1972	2	240,000		121
	2-191-D. Fisheries extension and marketing	1972	3	424,731		74
89-304	AFC-2. Investigation on the American shad in the St. Johns River	1968	3	94,240	1971	96
	AFCS-5. Study of anadromous fishes of Florida	1971	3	228,000		110
89-720	JF-2-2. Survey of the distribution and abundance of the Portuguese Man-O-War in waters adjacent to Florida	1969	3	165,520	1972	112
	GEORGIA					
88-309	2-10-R. Feasibility study of methods for improving oyster production in Georgia	1965	3	120,900	1968	118
	2-32-R. Preliminary survey of existing and potential marine resources on the Georgia coast	1966	1	3,570	1966	110
	2-35-C. Research vessel construction	1966	2	50,860	1968	59
	2-43-R. Seasonal abundance and biological stability of the commercial shrimp of Georgia	1966	3	94,320	1969	122
	2-44-R. Survey of a potential hard clam fishery	1966	2	38,850	1968	113
	2-46-R. Economic survey of the marine commercial fishery industry in Georgia	1966	2	24,640	1968	64
	2-68-R. Exploratory study of the commercial marine resources of the Georgia coast	1968	2	82,680	1970	65
	2-82-R(4b). Cooperative blue crab study - South Atlantic States	1969	1	25,000	1970	124
	2-84-R. A study of the nutritional, physiological, and economic requirements for the production of channel catfish in an intensive running water culture	1969	3	105,000	1972	47
	2-87-R. Preliminary studies of a potential finfish industry from commercial shrimp landings	1969	2	39,310	1971	122

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	2-74,115-S. Coordination of P.L. 88-309	1970	5	109,300	1973	60
	2-116-R. Studies on the ecology of Georgia's estuarine waters	1970	3	369,640		80
	2-117-R. Catfish fingerling production under intensive running water conditions	1970	1	10,000	1971	47
	2-172-R. The requirements of the catfish for several nutritional and physiological variables	1972	2	78,750		47
89-304	AFC-1. Shad fishery of the Altamaha River	1967	1	27,570	1968	96
	AFC-6. A study of the nursery areas and biology of juvenile anadromous fishes of the Altamaha River, Georgia	1968	2	47,630	1970	94
	GUAM					
88-309	H-7-D. A study to determine the feasibility of developing a deep sea commercial fishing industry on Guam	1966	3	148,585	1969	65
	H-12-D. Development of Guam's commercial fisheries potentials	1969	3	120,000	1972	68
	HAWAII					
88-309	H-1-D. Development of a prawn fishery	1966	2	88,379	1969	47
	H-2-R. Investigation for the development of a commercial oyster industry	1966	2	34,611	1969	118
	H-3-R. Central Pacific Tuna Conference	1966	1	4,000	1966	78
	H-4-R. Management investigation of the akule or jack mackerel (Trachurops crumenophthalmus)	1966	3	25,878	1969	98
	H-5-R. Management investigations of two species of spiny lobster, Panulirus japonicus and P. penicullatus	1966	3	10,144	1969	116
	H-6-R. Management and development investigations of the Kona crab (Ranina serrata)	1966	3	20,434	1969	115
	H-9-R. Publication of Central Pacific Tuna Conference proceedings and background	1976	1	5,000	1966	78
	H-10-R. Handling baitfish in Hawaii	1966	3	26,000	1969	87
	H-13-R. Commercial oyster fishery development investigations	1969	3	65,800	1972	118
	H-14-D. Development of a prawn culture industry	1969	3	135,375	1972	47
	4-24-D. Development of a prawn culture industry in Hawaii	1972	3	156,000		47

Public Law	Project number and title	Date initiated Year	Duration Years	Estimated total cost Dollars	Date completed Year	Project narrative Page
	IDAHO					
88-309	1-1-D. Experimental rearing of steelhead trout at Hayden Creek ponds	1966	3	62,688	1970	107
	1-9-C. Construction of Hayden Creek rearing ponds	1966	2	65,324	1969	54
	1-51-C. Construction of Hayden Creek rearing ponds	1969	2	30,200	1971	54
	1-57-D. Test rearing of anadromous fish, Lemhi River drainage	1970	4	89,300		48
	ILLINOIS					
88-309	4-13-R. Clam industry in Illinois	1966	2	16,300	1968	114
	4-32-R. Feeding-out catfish in cages	1967	2	31,793	1969	48
	4-33-R. Investigations of problems associated with the confinement of warm-water fishes in holding tanks	1967	2	31,300	1969	48
	4-35-D. Consumer education and market development	1967	2	21,200	1970	74
	4-36-R. Physiological and behavioral relationships among species of fishes	1968	2	22,470	1970	92
	4-50-R. Significance of ionic content of water in determining the growth and handling quality of channel catfish	1969	3	51,120	1972	88
	4-51-R. Considerations in the commercial production of channel catfish in cages	1969	2	25,380	1971	48
	3-165-R. Stabilization of environmental conditions in fish production ponds	1973	2	41,871		48
89-304	AFC-2. Histology of the thyroid and pituitary glands in the alewife	1970	2	33,000	1972	94
	INDIANA					
88-309	4-10-R. Mussel research study	1966	2	31,960	1968	117
	4-16-R. Inland waters commercial fisheries studies	1966	2	20,900	1968	92
	4-43-R. Interspecies relationships of fish in Indiana waters of Lake Michigan (See 3-150-R)	1968	3	36,000	1971	92
	3-150-R. Interspecies relationships of fish in Indiana waters of Lake Michigan	1971	3	75,600		92
	IOWA					
88-309	4-11-R. Industrial and commercial food fish investigations	1966	6	161,000	1972	92

(continued)

Public Law	Project number and title	Date initiated Year	Duration Years	Estimated total cost Dollars	Date completed Year	Project narrative Page
	2-156-R. Shovelnose sturgeon investigations	1971	3	30,000		109
	2-178-R. Channel catfish investigations	1972	3	55,840		88
	KANSAS					
88-309	4-1-R. Investigations on digestion and metabolism of channel catfish	1965	3	72,840	1968	88
	4-45-R. Investigations on nutrition and metabolism of catfish and utilization of fisheries products	1969	3	84,000	1971	88
	2-170-R. Investigations on nutrition and metabolism of the channel catfish	1972	3	84,000		88
	KENTUCKY					
88-309	4-19-R. Mussel fishery investigations	1966	3	45,800	1969	117
	4-27-R. Catfish fishery investigations	1967	2	25,880	1968	88
	4-48-R. Influences of the effluent from a concentrated industrial complex on a large river	1969	3	60,000	1971	84
	4-70-R. Kentucky Lake commercial catfish catch analysis	1970	2	9,000	1972	88
	2-171-R. Commercial fishing investigations of Nolin and Rough River Reservoirs	1972	2	10,700		126
	2-186-R. Commercial fishery investigations of the Kentucky River	1972	2	69,000		92
	LOUISIANA					
88-309	2-21-R. Coastwide study of penaeid shrimp	1965	1	124,840	1966	122
	2-22-R. Cooperative Gulf of Mexico estuarine inventory and study	1966	5	784,740	1970	81
	2-23-D. Oyster lease control monuments	1966	4	301,388	1970	119
	2-24-D. Shell planting for oyster cultch	1966	1	25,000	1966	119
	2-27-D(4b). Rehabilitation and restoration of oyster seed grounds	1966	1	100,000	1966	125
	2-54-D. Shell planting for oyster cultch	1967	1	105,000	1967	119
	2-57-D. Gulf of Mexico estuarine film	1967	2	7,900	1969	68
	2-63-C. Construction of saltwater culture ponds	1968	1	92,935	1969	50
	2-72-R. Evaluation of experimental oyster tonging reefs in Calcasieu Lake	1969	3	45,000	1971	119

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	2-90-R. Experiments to reestablish historical oyster seed grounds and to control the Southern oyster drill	1969	3	102,000	1972	119
	2-91-R. A study of the clam, Rangia cuneata, in Lake Pontchartrain and Lake Maurepas	1969	3	107,000	1972	114
	2-92-R. A study of the blue crab fishery in Louisiana	1969	3	97,000	1972	115
	2-93-R. Investigations of commercially important penaeid shrimp in Louisiana's estuaries	1969	3	170,000	1972	122
	2-94-R. A study of commercially important estuarine-dependent industrial fishes	1969	3	86,000	1972	110
	2-101-D(4b). Rehabilitation of natural oyster seed grounds destroyed or damaged by Hurricane Camille	1969	1	176,388	1970	124
	2-114-D. Clam shell planting for oyster cultch	1970	1	200,000	1970	119
	2-118-D. Control monuments for oyster leases	1970	3	280,000	1973	119
	2-20,130-S. Coordination	1965	7	102,730		60
	2-168-R. An inventory and study of the Vermilion Bay-Atchafalaya Bay estuarine complex	1972	3	140,000		81
	2-188-R. An inventory and study of the Lake Pontchartrain-Lake Maurepas estuarine complex	1972	3	130,000		81
	2-189-R. A study of the fauna in dredged canals of coastal Louisiana	1972	3	140,000		81
	2-190-R. Development of an areal management concept for Gulf penaeid shrimp	1972	4	270,000		78
89-304	AFSC-1. Ecological factors affecting anadromous fishes of Lake Pontchartrain and its tributaries	1967	3	78,880	1970	81
	MAINE					
88-309	3-12-R. Northern shrimp - biological and technological research	1966	3	134,196	1970	122
	3-13-D. Maine marine fishes extension service	1966	7	176,000	1973	68
	3-14-R. Lobster research program	1966	5	309,600	1971	116

(continued)

Public Law	Project number and title	Date initiated Year	Duration Years	Estimated total cost Dollars	Date completed Year	Project narrative Page
	3-15-R. The development of commercial fisheries estuarine resources	1966	4	81,914	1970	110
	3-16-R. Biological, environmental, and technological research on marine worms	1965	6	234,000	1971	113
	3-17-D. Study of the economic and operational feasibility of mechanization of the Maine sardine-processing canning operations	1965	2	95,000	1967	70
	3-18-R. Investigation of physical aspects of raw herring	1966	1	7,247	1966	70
	3-24-D. Promotion and market development	1966	3	194,028	1970	74
	3-72-C. Laboratory and tank room construction	1969	1	124,000	1970	57
	3-83-C. Marine research laboratory construction	1969	1	124,000	1970	57
	3-94-D. Testing and adapting existing sardine processing equipment	1969	1	8,000	1969	70
	3-115-D. Market development	1970	3	131,100		74
	3-117-R. Northern shrimp - assessment of some population parameters	1970	3	96,000		122
	FWAC-1,2. Statewide comprehensive fish, wildlife, and marine management plan	1968	5	48,116		78
	3-153-R. Lobster research program	1971	4	216,000		116
	3-158-R. Marine worm research	1972	3	117,000		113
	3-170-R. Escalator dredge study	1972	2	42,000		81
	3-176-D. Market development	1973	3	150,000		74
	3-177-D. Marine resources extension service	1973	3	100,000		68
	3-70,123,183-S. Coordination of research and development projects	1967	8	359,200		60
89-304	AFC-2. Increased development of the commercial anadromous fishery resources	1967	2	48,000	1969	95
	AFC-6. Stream improvement and fishway construction	1968	4	100,000	1972	52
	AFCS-9. Phase II, marine research laboratory construction	1970	2	200,000	1972	57

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	AFSC-11. Statewide comprehensive wildlife management plan	1968	1	2,852	1969	78
	AFSC-13. Statewide comprehensive fish, wildlife, and marine management plan	1969	2	42,412	1972	78
	AFC-14. Development and management of alewife, blueback, and shad resources	1969	4	125,000	1973	95
	AFC-15. Fishway construction and stream improvement	1971	3	180,000		52
	MARYLAND					
88-309	3-20-R. Development of a disease-resistant oyster brood stock	1967	1	19,500	1968	61
	3-20-R(4b). Development of a disease-resistant oyster brood stock	1966	2	22,000	1967	124
	3-21-R. Determination of the distribution and abundance of the winter flounder	1966	2	26,672	1967	97
	3-23-R. Study of the effects of thermal pollution on oysters in the Patuxent River estuary	1966	2	17,488	1967	84
	3-26-R. Studies of the physical and chemical properties of the estuarine environment associated with fish kills	1966	1	21,000	1967	81
	3-27-R. Tagging of juvenile striped bass in Chesapeake Bay estuaries	1966	2	36,595	1968	108
	3-29-R. Studies of the physical processes of movement and dispersion of oyster larvae	1966	1	18,000	1967	119
	3-30-R. Suspended sediments in Chesapeake Bay	1966	3	81,206	1969	81
	3-42-D. An economic study of the fisheries and seafood processing industries with emphasis on the Chesapeake Bay area	1966	3	41,100	1969	64
	3-56-R. Biologic and environmental control of Eurasian milfoil (Myriophyllum spicatum L.) in Chesapeake Bay	1967	3	39,965	1970	86
	3-65-S. Coordination	1967	3	56,000	1970	60
	3-66-D. Market development for Chesapeake Bay seafoods	1967	3	493,800	1971	75
	3-71-D. Maryland marine fisheries extension service	1967	3	57,800	1970	68
	3-75-R. Development of disease-resistant oysters (C. virginica) under field conditions in lower Chesapeake Bay	1967	3	97,500	1971	61

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	3-81-D. Pasteurization of crabmeat through the use of radio frequency waves	1968	1	41,900	1969	70
	3-86-D. Oyster shucking study	1968	2	61,000	1970	70
	3-91-R(4b). Blue crab study in Chesapeake Bay, Maryland	1968	1	24,500	1969	125
	3-93-R. The effects of the Maryland hydraulic clam dredge on populations of the softshell clam	1969	3	50,000	1971	82
	3-108-R. Blue crab study in Chesapeake Bay	1969	3	240,000	1973	115
	3-126-D. Seafood extension service	1970	3	75,000		69
	3-129-D. Oyster processing study	1970	1	40,726	1971	70
	3-131-R. Molluscan mortality studies	1970	3	107,210		61
	3-132-D. Maryland seafood marketing	1970	3	369,340		75
	3-144-D. National molluscan film	1970	2	8,000	1972	69
	3-152-D. Engineering principles as applied to oyster processing problems	1971	2	104,000		70
89-304	AFSC-1. Ecological study of Susquehanna River and tributaries below Conowingo Dam and their contribution to anadromous fish populations of Upper Chesapeake Bay	1967	3	228,300	1970	84
	AFC-3. Stream improvement program for anadromous fish management	1967	3	218,272	1970	85
	AFC-4. Suspended sediments in Chesapeake Bay	1969	1	45,000	1970	82
	AFC-5. Suspended sediments in Chesapeake Bay	1970	1	85,000	1971	82
	AFC-6. Coordination service	1970	1	13,000	1971	60
	AFC-8. Survey of anadromous fish spawning areas	1970	3	423,700		92
89-720	JF-3-1. A study of the biology of sea nettles to develop potential methods for control of their abundance	1968	2	200,000	1970	112
	JF-3-7. A study of the biology of sea nettles to develop potential methods for control of their abundance	1970	3	240,000	1973	112

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	MASSACHUSETTS					
88-309	3-35-R. Marine food science and technology research on sanitation and handling for purpose of improving product quality and shelf-life of Massachusetts commercial fishery products	1967	3	155,913	1970	70
	3-37-D. Collection, compilation, evaluation, and dissemination of commercial fisheries statistics	1966	7	134,945	1973	126
	3-38-R. Identification of winter flounder subpopulations	1966	2	32,000	1969	97
	3-39-C. Cat Cove dike	1966	1	30,000	1967	51
	3-50-D. Consumer education and market development	1966	4	480,000	1970	75
	3-52-C. Cat Cove pier and pool	1966	2	54,000	1968	51
	3-60-D. Shellfish technical assistance	1969	4	86,820	1972	69
	3-73-R. Study of the feasibility and application of Danish seining to the Massachusetts fishing industry	1967	1	45,000	1968	65
	3-74-C. Marine research laboratory construction	1968	4	400,000	1972	57
	3-76-C. Marine research vessel acquisition	1967	2	40,000	1969	59
	3-87-R. Winter flounder investigations	1969	5	123,500		98
	3-107-R(4b). Disaster relief: Massachusetts haddock fishery	1969	1	200,000	1970	125
	3-109-D. Massachusetts commercial fisheries extension service	1969	4	200,000		69
	3-40,134-S. Coordination	1966	7	247,900		60
	3-136-D. Massachusetts fisheries marketing program	1970	3	299,199		75
	3-178-D. Shellfish technical assistance	1973	4	94,000		69
89-304	AFC-1. Anadromous fish investigations	1967	4	80,000	1970	53
	AFCS-9. Anadromous fisheries development	1970	4	230,000		53
	AFC-12. Biological assessment of the alewife population, Parker River, Massachusetts	1972	3	33,000		95

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	MICHIGAN					
88-309	4-2-R. Surveillance of lake trout restoration in Michigan waters of Lake Michigan	1966	4	129,044	1969	90
	4-59-R. Lake trout restoration studies	1969	3	143,000	1972	90
	4-63-D(4b). Whirling disease control	1969	1	65,000	1970	125
	3-168-R. Assessment of 1972 lake trout populations in Lake Michigan	1972	3	120,000		90
89-304	AFC-1. Appraisal of stocks of anadromous fishes in the Michigan waters of the Great Lakes	1967	1	35,350	1967	92
	AFC-7. Parasites, disease, and disease control of Great Lakes anadromous and commercial fish	1968	3	213,187	1970	62
	AFSC-8. Great Lakes fish resource development study	1968	3	120,000	1971	78
	AFC-9. Parasites and diseases of anadromous and commercial fish	1970	3	271,368		62
	MINNESOTA					
88-309	4-8-R. Minnesota commercial fisheries improvement - Western Lake Superior	1965	4	52,216	1969	90
	4-22-D. Development of under-ice horizontal sonar scanning equipment and technique for locating fish schools	1966	3	15,300	1969	65
	4-38-R. Lake Superior commercial fisheries assessment studies	1968	3	37,500	1971	90
	4-39-R. Minnesota commercial fisheries improvement - Lake of the Woods	1968	4	105,978	1971	93
	4-44-R. A physiological study of thermal stress in channel catfish	1968	2	13,500	1970	89
	3-143-R. Factors determining the relationships of the burbot to other associated species in Minnesota waters	1971	3	41,639	1973	93
	3-151-R. Lake Superior commercial fisheries assessment studies	1971	3	45,000		91
89-304	AFC-2. Anadromous fish habitat development	1967	1	16,000	1968	85
	MISSISSIPPI					
88-309	2-25-R. Cooperative Gulf of Mexico estuarine inventory and study - Mississippi	1966	4	396,000	1970	78

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	2-28-R. A study of coliform bacteria and E. coli on polluted and unpolluted oyster bottoms of Mississippi and a study of depuration by rebedding	1966	3	111,500	1969	62
	2-42-R. A seasonal study of nektonic and benthic faunas of the shallow gulf off Mississippi out to the fifty-fathom curve	1966	3	113,800	1969	86
	2-59-D. Gulf of Mexico estuarine film	1967	2	7,900	1969	68
	2-61-R. A study of bacterial spoilage in iced Penaeus shrimp	1967	3	57,100	1970	71
	2-85-R. A study of the parasites and diseases of fish, mollusk, and crustacea utilized in mariculture	1969	3	120,000	1972	62
	2-103-D(4b). Rehabilitation and restoration of oyster grounds damaged by the hurricane of August 17, 1969	1969	1	105,000	1970	124
	2-111-R. Coordination and planning, fisheries resources research and development, Mississippi	1970	1	30,000	1970	78
	2-123-R. A study of the blue crab fishery in Mississippi	1970	3	94,500		115
	2-124-R. Investigation of commercially important penaeid shrimp in Mississippi estuaries	1970	3	110,000		122
	2-128-R. Investigations of coastal pelagic fishes	1970	3	93,000		110
	2-174-R. Parasites, diseases, and control of diseases of commercially important finfish and shellfish	1972	3	125,000		62
89-304	AFCS-1. A study of the striped bass in Mississippi waters	1967	4	196,600	1970	108
	AFCS-2. Anadromous fish laboratory construction	1969	1	50,000	1970	57
	AFCS-4. Experimental stocking of striped bass	1970	3	210,000		108
89-720	JF-2-1. Population studies of coelenterates with special emphasis on noxious planktonic forms	1967	4	164,162	1971	112
	JF-2-8. Population studies of noxious coelenterates of Mississippi Sound	1971	3	166,050	1973	112

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	MISSOURI					
88-309	4-3-R. Research and management of commercial fisheries	1966	6	151,557	1972	126
	4-34-D. Palatability of Missouri fish	1967	2	15,200	1969	71
	4-66-R. Transmission of an ovary parasite of the golden shiner	1970	1	4,313	1971	62
	2-131-D. Equipping fish disease laboratory	1970	1	5,403	1971	62
	2-164-R. Influence of light intensity on food conversion of channel catfish	1971	1	4,807	1972	89
	2-187-R. Anatomical and histological description of the channel catfish (Ictalurus punctatus)	1972	3	26,000		89
	2-199-R. Research and management of Missouri's commercial fisheries resources	1973	3	100,000		127
	MONTANA					
88-309	1-19-D. Fort Peck Reservoir fishery investigations	1966	4	101,334	1970	93
	1-20-C. Construction of fishery research vessel for Fort Peck Reservoir fishery investigations	1966	1	20,000	1967	59
	1-45-R. An economic study of marketing Montana commercial fisheries products	1967	2	20,400	1969	64
	1-56-D. Commercial fishery of Fort Peck Reservoir	1970	3	75,900		93
	NEBRASKA					
88-309	4-4-R. Establishment of the seasonal distribution and availability of commercial fish species in the waters of Nebraska	1966	3	47,280	1969	93
	4-17-D. Design and construction of facilities relative to trapping and handling of commercial species	1966	1	54,000	1967	51
	4-57-R. Commercial fishery investigations	1969	3	88,000	1972	93
	2-195-R. Survey of the commercial fisheries industry of Nebraska	1972	1	11,333		127
	2-196-R. Evaluation of an electric weir as a harvest method for commercial fish	1972	1	12,000		93
	NEVADA					
88-309	6-9-D. Rearing bait fishes in the desert southwest	1968	5	166,229		87

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	NEW HAMPSHIRE					
88-309	3-31-R. Soft-shell clam population study in Hampton-Seabrook Harbor, New Hampshire	1966	3	12,000	1969	114
	3-32-R. An investigation of the possibility of seed oyster production in Great South Bay, New Hampshire	1966	3	74,767	1969	119
	3-105-R. A comparative study of conventional and experimental inshore lobster gear	1969	2	40,650	1971	65
	3-122-D. Acquisition of marine workboat	1970	1	20,000	1971	59
	3-146-D. National molluscan film	1971	1	4,000	1972	69
	3-155-R. Lobster research program	1971	3	90,000		116
89-304	AFC-1. Commercial fisheries development	1968	4	230,000	1972	53
	AFC-2. Anadromous salmon hatchery construction	1973	2	900,000		54
	NEW JERSEY					
88-309	3-1-D. Shell planting program Maurice Cove (Delaware Bay) and Mullica River	1965	5	757,640	1970	119
	3-2-R. Evaluation of the menhaden and shad fishery in Delaware Bay and adjacent waters	1966	2	38,002	1968	110
	3-3-R(4b). Disease-resistant oyster program - Delaware Bay	1966	2	75,000	1967	124
	3-3-R. Disease-resistant oyster program - Delaware Bay	1967	5	150,000	1972	62
	3-78-R. Inventory of major estuarine systems (See 3-137-R)	1968	2	162,300	1970	82
	3-114-R. A study of the basic food chain relationship in coastal salt marsh ecosystems	1969	2	21,313	1971	82
	3-120-D. Shell planting program	1970	3	300,000	1973	120
	3-137-R. Inventory of major estuarine systems	1970	4	259,000		82
	3-145-D. National molluscan film	1971	1	8,000	1972	69
89-304	AFCS-1. Population and migration study of major anadromous fish	1967	2	59,500	1968	96
	AFC-2. Anadromous fish inventory	1972	4	23,800		95

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	NEW MEXICO					
88-309	6-11-R. Investigations of commercial fishery potential of rough fish species	1968	4	58,000	1972	87
	6-20-R. Vertical raceways and water re-use as a means of maximizing commercial trout production	1971	2	57,500	1973	48
	2-198-R. Experimental harvest of "rough" fishes from Elephant Butte Lake, New Mexico	1972	3	54,186		87
	NEW YORK					
88-309	3-9-D. Management planning for New York freshwater commercial fisheries	1966	3	120,000	1970	78
	3-10-C. Construction of a marine research and development laboratory	1966	3	383,000	1969	57
	3-11-D. Pilot plant depuration of hard clams	1965	1	39,000	1966	114
	3-63-R. Pond culture of oyster seed in a controlled natural environment	1967	5	214,320	1973	48
	3-68-D. Studies of problems involved when hard clams in commercial quantities are subjected to the depuration process	1967	2	101,000	1968	114
	3-95-D. Operation and maintenance of marine laboratory	1969	3	107,000	1972	76
	3-100-R. A study of burrow selection by the American lobster	1970	4	57,500		116
	3-101-R. A study of bay scallop growth during fall, winter, and spring in heated salt water	1970	3	67,000		48
	3-116-D. Shellfish sanitation control	1970	6	122,200		123
	3-119-R. Development of New York State's freshwater commercial fisheries	1970	1	24,000	1970	79
	3-139-D. Coordinated commercial fishery statistics program for the State of New York	1971	3	105,000	1972	127
	3-154-D. National molluscan film	1971	1	10,000	1972	69
	3-84,160-S. Coordination of research and development	1968	7	190,438		61
	3-161-D. Operation and maintenance of marine laboratory, Flax Pond, Old Field	1972	3	150,000		76

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
89-304	AFC-4. Evaluation of present and potential sturgeon fisheries of the St. Lawrence and adjacent waters	1968	2	80,000	1970	109
	AFC-8. A study of striped bass in the marine district of New York	1972	3	120,000		108
89-720	JF-3-3. A study of the overwintering germinating stages of floating marine algae in Great South Bay, New York	1968	4	50,250	1971	112
	JF-3-5. A study of the setting, attachment, and growth of Codium fragile on shellfish in Long Island waters	1969	4	88,000	1973	112
	NORTH CAROLINA					
88-309	2-6-R. Oyster studies	1965	3	59,280	1969	120
	2-8-R. A study of the quality of North Carolina scallops	1965	3	37,100	1968	71
	2-9-R. Studies on macroplankton crustaceans and ichthyoplankton of the Pamlico Sound complex	1965	2	20,683	1967	82
	2-26-R. Shrimp studies	1966	3	95,050	1969	122
	2-51-C. Equipping exploratory fishing vessel	1967	1	25,000	1968	59
	2-73-C. Equipping exploratory fishing vessel to increase research capabilities	1968	1	16,000	1969	59
	2-76-R. Studies on the effects of processing on the quality of seafood products	1968	1	16,700	1969	71
	2-80-R(4b). Cooperative blue crab study - South Atlantic States	1969	1	10,000	1970	124
	2-95-R. Scrap fish studies	1969	2	82,000	1971	110
	2-100-R. The investigation of methods for improving and evaluating the quality of seafood products	1969	3	50,100	1972	71
	2-129-R. Studies of commercial penaeid shrimps	1970	1	14,930	1971	122
	2-139-R. Plan for fisheries resources research and development, North Carolina	1971	1	14,930	1971	79
	2-173-D(4b). Rehabilitation of oyster grounds in the Pamlico Sound area damaged or destroyed by Hurricane Ginger	1972	1	80,000	1973	125
	2-175-R. Survey of nursery areas in western Pamlico Sound	1972	2	135,000		79

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	2-197-R. Effects of post-harvest handling, processing and storage on quality and properties of seafood	1972	3	50,100		71
89-304	AFC-1. The status, abundance, and exploitation of striped bass in the Roanoke River and Albemarle Sound, North Carolina, and the spawning of striped bass in the Tar River, North Carolina	1967	3	60,000	1970	109
	AFC-4. Factors affecting survival of immature striped bass	1968	3	39,504	1970	109
	AFC-5. Offshore anadromous fish exploratory fishing program	1968	4	235,796	1971	66
	AFCS-8. Anadromous fish research program, northern coastal region	1971	3	460,000		110
89-720	JF-2-9. Survey of the distribution, abundance, species composition, and economic importance of noxious coelenterates	1971	2	42,500	1972	112
	NORTH DAKOTA					
88-309	4-15-R. Garrison Reservoir commercial fishery investigation	1966	4	30,000	1970	89
	4-20-D. Commercial fish market for North Dakota fisheries	1966	2	10,000	1968	64
	4-23-D. A survey of commercial fisheries on the mainstem reservoir of the Upper Missouri River system	1966	1	4,500	1967	93
	4-30-R. A study of the commercial fishery potential of Lake Ashtabula	1967	3	18,300	1969	89
	4-54-R. Investigations of gonadatrophins in stimulating spawning in white suckers	1969	2	3,500	1971	91
	4-55-R. A determination of nutrient exchanges and biological nutrient removal from Lake Ashtabula	1969	4	75,000		85
	4-69-R. Lake Sakakawea commercial fishery investigations	1970	3	25,500	1973	89
	4-71-R. Cage culture of black bullheads	1970	2	7,000	1971	48
	1-83-R. Investigations of cage culture of rainbow trout	1972	3	9,000		49
	OHIO					
88-309	4-6-R. Lake Erie commercial fisheries research	1966	4	53,462	1969	89

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	4-26-R. Value of whole fish meal in breeding gestation rations for swine	1967	3	85,500	1969	71
	4-28-R. Mussel fisheries investigations	1967	3	114,500	1970	117
	4-47-R. The status of whirling disease in Ohio waters	1969	1	16,000	1970	62
	4-56-R. Fisheries investigations - Lake Erie	1969	2	28,700	1972	89
	4-64-D. Ohio's live bait industry - its extent, condition, and problems	1969	2	15,750	1971	64
	4-65-R. Effect of whole fish meal on reproductive performance of swine	1970	2	50,000	1971	71
	4-68-R. Detection of Myxosoma cerebralis spores in holding facilities for trout	1970	3	55,000	1973	63
	3-159-R. Physiological effect of fish meal on swine reproduction	1972	3	87,000		72
89-304	AFCS-1. A study of the physical characteristics of the major reef areas in the Western Basin of Lake Erie	1967	3	118,000	1970	85
	OKLAHOMA					
88-309	4-24-R. Commercial fisheries investigations	1966	4	71,260	1969	85
	4-25-D. Commercial fisheries statistics	1967	2	30,140	1969	127
	4-60-R. Flathead catfish movements	1969	2	34,000	1971	89
	2-140-R. Planning for the development of the commercial fishery in Oklahoma	1971	1	2,880	1971	79
	2-154-R. Oklahoma commercial fishing industry management program	1971	3	100,000		66
	OREGON					
88-309	1-3-R. Study on the distribution and abundance of pink shrimp in the Pacific Ocean off Oregon	1965	5	141,832	1970	123
	1-4-R. Investigation of the abundance and recruitment of bottomfish off Oregon with emphasis on Dover sole	1965	5	165,390	1970	98
	1-5-R. Controlled rearing of Dungeness crab larvae and the influence of environmental conditions on their survival	1965	5	67,774	1970	115
	1-10-D. Development of the shad industry	1966	4	71,771	1970	72

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	1-12-R. Utilization of hake, dogfish, and by-products of the fillet industry for protein supplements	1966	4	134,167	1970	72
	1-15-R. Processed hake in feed for mink	1965	3	18,153	1968	72
	1-25-R. Utilization of hake for human food	1969	1	16,000	1970	72
	1-27-R. Laboratory hatching and rearing of Pacific Coast clams and oysters	1967	3	62,983	1970	114
	1-34-R. Preparation of marine protein concentrate from hake	1967	3	60,000	1970	72
	1-38-R. Biology of Columbia River shad and the development of selective commercial fishing gear	1967	1	12,000	1969	96
	1-46-R. Boat charter	1967	3	76,800	1970	111
	1-58-D. Development of new human food products from shad	1970	1	12,000	1971	72
	1-59-D. Utilization of hake for human food	1970	3	50,000	1973	72
	1-60-R. Clam-oyster-abalone larval rearing	1970	3	52,000	1973	49
	1-61-R. Data analysis - Dover sole stocks	1970	1	38,500	1971	127
	1-62-R. An evaluation of methods for determining movements of shrimp	1970	1	28,500	1971	123
	1-63-R. Discoloration of fresh and frozen crab meat	1970	3	44,250	1973	73
	1-64-R. Preparation of fish protein concentrate from hake	1970	1	18,000	1971	73
	1-66-R. Crab larval rearing	1970	1	15,500	1971	49
	1-67-D. Utilization of dogfish for human food	1971	1	14,000		73
	1-8,68-S. Coordination	1966	6	42,434	1971	61
	1-69-R. Preparation of fish protein hydrolysates	1970	3	44,000	1973	73
	1-77-D. Estuary resource surveys	1971	2	92,000	1973	82
	1-78-D. Resource survey of the continental shelf off Oregon	1971	4	366,000		98

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
89-304	AFC-10. Shad and striped bass management study	1968	2	33,600	1970	97
	AFC-11. Rearing ponds - North Nehalem River salmon hatchery	1967	1	172,000	1968	54
	AFC-17. Construction of the Elk River salmon hatchery	1967	1	476,000	1968	54
	AFC-18. Development and improvement of hatchery techniques for Pacific salmon and steelhead trout	1967	4	856,400	1970	103
	AFC-19. Management of the troll salmon fishery with emphasis on the collection of data on shore and at sea for regulation formulation	1966	4	134,400	1970	103
	AFCS-20. Evaluate, coordinate, and plan Pacific salmon research and management activities on a coastwide basis	1967	2	129,290	1969	79
	AFC-21. Increased production of anadromous salmonids in Oregon coastal streams and lakes	1967	1	48,200	1968	103
	AFC-22. Production and distribution of anadromous salmonids from the Alsea River salmon hatchery	1967	1	66,805	1968	76
	AFC-23. Effects of logging on salmon populations in coastal streams	1968	3	64,400	1970	85
	AFC-25. Remove culvert and construct bridge to provide anadromous fish passage on Clear Creek, tributary to the Kilchis River	1968	1	10,000	1968	53
	AFC-26. Research and management on wild and hatchery produced salmon and steelhead in Oregon south coastal streams	1968	3	100,000	1969	103
	AFC-30. Hatch, rear, and release salmonids at the North Nehalem River salmon hatchery	1968	3	109,500	1970	76
	AFC-35. Provide passage for salmonids on Oregon coastal streams	1968	1	31,500	1969	53
	AFC-36. Hatch, rear, and release salmonids at the Elk River salmon hatchery	1968	2	91,750	1970	76
	AFC-39. Salmon investigations on the northern Oregon coast	1968	2	173,600	1970	104

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	AFC-40. Construction supplemental rearing pond adjacent to Trask River salmon hatchery	1969	1	228,000	1970	54
	AFC-43. Pink and chum salmon culture	1969	1	22,300	1970	49
	AFC-45. Rear and release salmonids at the Trask River rearing pond	1970	3	107,100	1973	76
	AFC-46. Effects of logging on abundance of coho salmon	1970	3	83,000	1973	85
	AFC-47. Operation of the Elk River salmon hatchery	1970	3	183,000	1973	76
	AFC-12,48. Coordination of Public Law 89-304	1968	4	23,000	1971	61
	AFC-49. Operation of rearing ponds - North Nehalem River salmon hatchery	1970	3	76,500	1973	77
	AFC-50. Improvement of salmon and steelhead trout hatchery techniques	1970	3	838,738	1973	104
	AFC-51. Salmon and steelhead mark processing center for Pacific Coast States	1970	3	200,500	1973	127
	AFC-52. Management of the troll salmon fishery	1970	3	157,200	1973	104
	AFC-53. Shad and striped bass management study	1970	3	61,500	1973	97
	AFC-54. Salmon research on coastal streams and reservoirs	1970	3	557,000	1973	104
	AFC-55. Culture of salmon acclimated to sea water	1970	2	20,000	1972	49
	AFC-59. Expansion of Elk River hatchery	1970	1	221,344	1971	55
	AFC-62. Construct a short-term rearing pond at the Trask River salmon hatchery	1971	1	15,000	1972	55
	AFC-66. Electrical barrier - North Nehalem hatchery	1973	1	15,000		55
	PENNSYLVANIA					
88-309	3-67-R. A study to establish a program to increase the production of high-value commercial fishes in Lake Erie	1967	3	180,000	1970	91
	3-85-R. Mussel investigations	1968	1	20,000	1969	117
	3-110-R. A study in the production of warmwater fish species in a vertical fish rearing facility	1970	3	79,250		49

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	3-112-R. Rearing trout in silos arranged in series	1970	3	111,618		49
	3-147-D. National molluscan film	1971	2	10,000	1972	69
	3-167-R. A commercial fish study of the Eastern Basin of Lake Erie	1973	5	277,170		93
89-304	AFCS-1. Feasibility of the restoration of shad runs in the Brandywine Creek and its tributaries	1967	2	35,000	1969	97
	AFC-4. Restoration of shad runs in the Brandywine Creek and its tributaries	1971	5	94,350		97
	PUERTO RICO					
88-309	2-38-C. Design and construction of an improved fishing boat	1966	2	7,240	1968	60
	2-39-R. Gear research and testing of improved commercial fishing boats	1966	3	136,130	1969	66
	2-40-C. Construction of commercial fisheries laboratory	1966	4	250,000	1970	57
	2-41-C. Construction of fishing port facilities	1966	5	250,000	1971	51
	2-70-R. Exploratory and test fishing for tuna	1968	2	206,720	1970	66
	2-71-D. Training of fishermen for the tuna industry	1968	1	5,786	1969	69
	2-89-R. Gear research, exploratory fishing, and demonstration	1969	3	370,000	1972	66
	2-97-R. Investigations on the resource potential of the spiny lobster (Panulirus argus Latreille) in Puerto Rico	1969	3	63,742	1972	117
	2-98-C. Construction of commercial fisheries laboratory facilities	1969	2	199,250	1971	58
	2-104-R. Investigation of green tuna meat	1969	3	30,000	1972	73
	2-37,127-S. Coordination and administration	1966	7	264,580	1973	61
	2-136-D. Acquisition of general use equipment for a fishery laboratory	1971	1	22,100	1972	58
	2-147-C. Commercial fisheries laboratory facilities, equipment, and incidental expenditures	1971	1	30,800	1971	58

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	2-153-R. The determination of mercury in commercially important aquatic organisms	1971	1	42,000	1972	82
	2-158-C. Construction of commercial fishing facilities	1971	3	400,000		51
	2-159-R. Survey of microconstituents of canned seafood and development of protective procedures	1971	3	75,000		73
	2-163-R. The development of cultures of the channel catfish and Tilapia species in Puerto Rico	1971	3	122,000		49
	2-56,182-R. Fisheries statistical program	1967	7	635,000		127
	2-183-R. Commercial fisheries survey and development	1972	3	292,000		69
	2-184-R. Investigation on the aquaculture potential of marine organisms	1972	3	143,600		49
89-720	JF-2-6. Investigation of the biology and control of noxious coelenterates occurring in the coastal waters of Puerto Rico	1969	4	91,810	1973	112
	RHODE ISLAND					
88-309	3-43-R. Investigation of the deep-sea red crab	1966	3	43,500	1969	115
	3-46-R. Investigation of the basic life history of the red crab	1966	3	21,600	1969	116
	3-53-R. Testing one-boat pelagic trawls on small draggers	1966	1	20,000	1967	66
	3-57-R. Mollusk environmental modification and control studies	1966	1	11,275	1967	123
	3-79-C. Wickford Marine Laboratory dock	1968	1	4,000	1968	58
	3-80-D. Development of a management plan for the sea scallop in Rhode Island	1968	1	22,100	1969	79
	3-90-R. Assessment of the efficiency of the Danish Vinge trawl over conventional New England drag nets	1968	1	12,900	1969	66
	3-113-R. The growth and movement of scup (Stenotomus chrysops) in Narragansett Bay	1971	2	36,500		121
	3-162-R. A study of stabilization of natural scallop populations by augmentation with hatchery reared seed	1973	3	91,735		121

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	AFSC-1. Construction of fish ladders	1967	6	430,000		53
	SOUTH CAROLINA					
88-309	2-2-R. Charting of subtidal oyster beds and experimental transplanting of seed oysters thereto from polluted seed oyster beds	1965	3	46,950	1968	120
	2-3-R. To manage and practice aquaculture in shrimp farm ponds and in large tanks under controlled conditions	1966	3	34,160	1969	50
	2-36-C. To add a refrigerating unit to existing system for temperature control of saltwater culture tanks	1966	1	2,110	1967	58
	2-69-R. Investigations into supplemental feeding of oysters	1968	1	8,890	1969	120
	2-79-R(4b). Cooperative blue crab study - South Atlantic States	1969	1	25,000	1970	124
	2-105-R. Survey of oyster fishery of South Carolina	1970	2	65,000	1972	120
	2-110-R. An investigation of the offshore demersal fish resources of South Carolina	1970	1	11,810	1971	111
	2-137-D. Development of an expanded commercial fisheries statistical program for South Carolina	1971	3	61,000		127
	2-138-R. A study on the black sea bass (Centropristes striatus)	1971	2	16,260		107
	2-179-D. Management and development of the shellfish industry in South Carolina	1972	3	122,419		120
89-304	AFC-1. Survey of sturgeon fishery of South Carolina	1967	1	5,340	1968	109
	AFC-4. Commercial anadromous fishery - Edisto River	1970	3	130,500		111
	SOUTH DAKOTA					
88-309	4-18-D. Commercial fishery industry survey	1966	5	88,000	1971	127
	4-21-D. Missouri reservoir fisheries product development and evaluation	1966	2	37,667	1968	73
	4-29-R. Effects of intensive bullhead removal in selected lakes in eastern South Dakota	1967	3	20,300	1969	90

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	4-37-D. Commercial fishing gear research and development for lakes and reservoirs in South Dakota	1968	3	13,535	1971	66
	4-61-R. Paddlefish population study	1969	3	8,800	1971	91
	1-74-D. Application of sonar fish detector techniques to increase annual production	1970	3	12,160	1973	67
	1-84-D. Publication of commercial fishing information	1973	3	15,000		128
	TENNESSEE					
88-309	4-5-R. Development of improved fishing methods for use in southeastern and southcentral reservoirs	1965	3	35,670	1968	67
	4-31-R. Evaluation of whole fish meal as a protein supplement for swine	1967	1	4,890	1968	73
	4-40-D. Formula development and acceptability evaluation of selected seafood entrees	1968	2	17,993	1970	73
	4-46-R. Freshwater mussel ecology - Kentucky Lake, Tennessee	1969	3	56,868	1972	117
	4-72-R. Investigations of parasites and diseases of cultured fishes	1970	1	9,970	1971	63
	2-142-R. Mechanisms of mercury transformation in bottom sediments	1971	1	20,000	1972	85
	2-144-R. Production of channel catfish in cages	1971	2	24,020	1973	50
	2-151-R. Studies of channel catfish virus disease	1971	1	6,667	1972	63
	2-176-R. Standardization of methyl mercury analysis	1972	1	24,060		69
	2-194-R. Parasites and diseases of cultured catfish	1972	3	32,000		63
	TEXAS					
88-309	2-12-R. An evaluation of the effects of estuarine engineering projects	1966	4	72,610	1970	82
	2-13-C. Construction of a Gulf research vessel	1966	1	122,300	1967	60
	2-14-C. Coastal fisheries experimental station	1966	3	514,000	1969	58

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	2-47-R. Northwestern Gulf of Mexico marine fisheries investigation - Study #1	1967	3	199,050	1970	111
	2-48-D. Gulf of Mexico estuarine film	1967	2	9,500	1969	68
	2-49-R. Commercial fishery landings statistical program - Study #1	1967	5	67,860	1971	128
	2-55-R. Study of migratory patterns of fish and shellfish through a natural pass	1967	3	126,630	1970	123
	2-62-D. Seafood marketing	1967	3	166,410	1970	75
	2-65-D(4b). Oyster rehabilitation in San Antonio Bay	1968	1	5,568	1969	125
	2-66-R. Experimental pond research planning	1969	1	5,490	1968	79
	2-77-C. Construction of storage building, coastal fisheries experiment station	1968	1	25,000	1969	58
	2-78-R. Saltwater pond research - Study #1	1968	3	211,404	1971	50
	2-88-C. Dredging boat and water intake channels	1969	1	22,500	1969	77
	2-99-C. Fence construction, coastal fisheries experiment station	1969	1	5,130	1970	58
	2-109-R. Northwestern Gulf of Mexico marine fisheries investigation - Study #2	1970	3	285,772	1973	111
	2-112-R. Ecological changes associated with the industrialization of Cedar Bayou and Trinity Bay, Texas	1970	3	67,536	1972	82
	2-122-C. Jetty construction, marine fishery research station	1970	1	33,140	1971	58
	2-132-R. The population and distribution of penaeid shrimp in lower Laguna Madre	1970	2	53,647	1972	123
	2-135-D. National molluscan film	1971	1	2,000	1972	69
	2-146-D. Commercial fishery landings statistical program - Study #2	1971	3	78,740		128
	2-155-R. Evaluation of effects of various coastal construction methods	1971	2	38,771	1973	83
	2-160-R. Determination of freshwater quantity standards for the Guadelupe estuary and San Antonio Bay system, Texas	1971	3	219,045		83

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	2-169-R. Saltwater pond research - Study #2	1971	3	253,000		50
	2-200-R. Fishery survey of Cedar Lakes and the Brazos and San Bernard estuaries, Texas	1973	2	57,800		83
	2-202-R. Study of commercial shrimp, rock shrimp, and commercial finfish	1973	2	160,000		123
	UTAH					
88-309	6-10-R. Investigation of the intensity of natural selection upon different phenotypes (blood types) of rainbow trout in commercial trout rearing ponds and reservoirs	1967	3	42,000	1971	91
	6-13-R. Genetic studies of rainbow trout strains being maintained by commercial and agency hatcheries	1971	2	46,056	1973	91
	1-82-R. Commercial fisheries in a typical large shallow eutrophic Rocky Mountain lake	1972	2	40,000		93
	VERMONT					
88-309	3-59-R. Investigation of the commercial fisheries potential of Lake Champlain	1967	2	19,605	1970	87
	3-148-D. National molluscan film	1971	1	10,000	1972	69
	VIRGIN ISLANDS					
88-309	2-33-R. Study of the fisheries potential of the Virgin Islands	1966	3	104,340	1969	67
	2-96-R. Exploratory fishing for a source of nonciguatoxic sport and food fish	1969	1	23,720	1970	67
	2-121-R. Research and development of deep-water commercial and sport fisheries around the Virgin Islands plateau	1970	1	28,310	1971	67
	2-161-R. Planning of Virgin Islands fisheries program	1971	1	5,600	1971	79
	2-192-R. Selective life history study of silk and blackfin snapper	1972	1	24,330		107
	2-193-R. Modernization of small Virgin Islands fishing boats and equipment	1972	1	24,330		69
	VIRGINIA					
88-309	3-5-D. Investigation of potential for expansion of the industrial fishery of the mid-Atlantic bight	1965	5	310,731	1970	111

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	3-6-R. Production of disease-resistant oysters	1967	3	184,325	1970	63
	3-6-R(4b). Production of disease-resistant oysters	1966	2	103,679	1967	124
	3-7-R. Investigation of oyster larvae and spat and certain environmental factors in a horizontally stratified estuary	1965	1	140,800	1966	120
	3-19-R. Characterization of coastal and estuarine fish nursery grounds as natural communities	1965	2	82,645	1967	83
	3-62-D. Propagation of disease-resistant oysters	1967		290,000	1969	63
	3-69-D. Consumer education and market development	1967	3	96,000	1970	75
	3-77-R. A study of the soft and hard clam resources of Virginia	1967	3	131,200	1970	114
	3-91-R(4b). Blue crab study in Chesapeake Bay - Virginia	1968	1	25,000	1969	125
	3-124-R. An investigation into commercial aspects of the hard clam fishery and development of commercial harvest gear for harvest of molluscs	1970	3	195,554	1973	67
	3-125-D. Virginia seafood marketing	1970	2	80,000	1972	75
	3-127-R. Testing of disease-resistant oysters	1970	1	23,750	1971	63
	3-141-D. National molluscan film	1970	2	16,000	1972	69
	3-164-D. Virginia seafood marketing	1972	2	80,000		75
	3-174-D. Fisheries statistics and library program	1972	3	31,059		128
	3-118,179-D. Shell planting program	1970	6	600,000		120
89-304	AFC-1. Biology and utilization of anadromous alosids	1967	4	600,165	1970	95
	AFC-7. Biology and management of river herring and shad	1970	3	665,000		95
89-720	JF-3-2. An ecological study of the jellyfish (Chrysaora quinquecirrha) in Lower Chesapeake Bay	1968	3	377,560	1971	113
	JF-3-9. Control measures for Chesapeake Bay jellyfishes	1971	3	240,000	1973	113

Public Law	Project number and title	Date initiated Year	Duration Years	Estimated total cost Dollars	Date completed Year	Project narrative Page
	WASHINGTON					
88-309	1-17-S. Coordination and planning	1965	2	24,000	1968	61
	1-18-R. Investigation of effects of specific areas of Grays Harbor on the emigration of yearling coho salmon from the rivers emptying into that harbor	1966	3	14,000	1969	104
	1-21-C. Construction of small fishways	1966	1	28,000	1967	53
	1-22-R. Monitor conditions of certain groundfish stocks, Washington trawl grounds	1966	4	369,080	1970	98
	1-24-D. Inspection of oyster seed - new Asiatic sources	1966	1	6,000	1967	120
	1-29-R. Early marine life history chum and pink salmon	1966	1	16,000	1967	104
	1-30-R. Field recovery, coded wire tag	1966	2	36,600	1968	104
	1-31-R. Willapa oyster studies	1966	2	56,000	1968	121
	1-32-R. Hatchery coho salmon, contribution to the fishery	1966	5	92,500	1971	104
	1-33-D. Evaluation of dry feed for hatchery salmon	1966	4	171,000	1970	104
	1-37-R. Analysis and publication of coded wire tag research data	1966	2	44,000	1968	105
	1-39-D. Mid-water trawl fisheries management investigations	1967	3	35,750	1970	67
	1-40-R. Larval and estuarial studies, pink and chum salmon populations	1967	2	64,000	1969	105
	1-41-R. Determination of the nutritive value of North Pacific fish meals for poultry	1967	2	36,000	1969	74
	1-42-D. Subtidal hardshell clam fisheries development	1967	4	125,405	1971	114
	1-43-R. Oyster drill (Ocinebra japonica) control	1967	4	55,600	1971	63
	1-49-C. Bivalve larvae experimental rearing pond construction	1968	1	12,500	1969	51
	1-50-C. Samish hatchery concrete ponds construction	1969	2	67,662	1971	55
	1-52-R. Dungeness crab study	1969	2	41,000	1971	116

(continued)

Public Law	Project number and title	Date initiated Year	Duration Years	Estimated total cost Dollars	Date completed Year	Project narrative Page
	1-54-R. Pink and chum salmon prediction studies	1970	2	38,000	1971	105
	1-55-R. Ocean salmon fisheries sampling	1970	1	72,123	1971	105
	1-70-R. Monitoring conditions of certain groundfish stocks, Washington trawl grounds	1970	1	137,540	1971	98
	1-71-R. Mid-water trawl fishery data analysis	1970	1	14,000	1971	128
	1-72-D. Capital Lake fall chinook rearing program	1970	1	45,200	1971	105
	1-73-D. Hatchery dry feed field tests	1970	1	45,000	1971	105
	1-75-R. Trawl fishery monitoring and data analysis studies	1971	2	273,528	1973	98
	1-76-R. Dungeness crab study	1971	2	47,000		116
	1-79-D. Subtidal clam investigations	1971	2	83,000		114
	1-81-R. Puget Sound baitfish studies	1971	2	56,400	1973	97
89-304	AFC-1. Salmon rearing operations	1967	1	392,000	1967	77
	AFC-4. Planning and coordination	1967	4	22,000	1969	61
	AFC-5. Construction of Soleduck salmon hatchery	1967	3	1,666,000	1970	55
	AFC-8. Stream improvement planning	1967	1	20,000	1968	79
	AFC-9. Samish salmon hatchery supplemental water supply and rearing pond system	1967	2	98,000	1969	55
	AFC-12. Port Susan-Port Gardner pink salmon studies - stock separation and identification	1967	1	18,500	1968	105
	AFC-13. Measurement of spawning success and fry quality of chum salmon utilizing natural and controlled spawning areas at Big Beef Creek, Washington	1967	3	306,022	1970	105
	AFC-14. Gill net dropout study	1968	2	45,100	1970	106
	AFC-15. Nooksack hatchery coho yearling pond construction	1968	1	30,000	1969	55
	AFC-16. Simpson hatchery rearing pond construction	1968	1	92,000	1969	55

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	AFC-17. Issaquah hatchery coho yearling pond construction	1968	1	22,000	1969	55
	AFC-23. Cascade River stream improvement	1968	1	9,200	1969	85
	AFC-24. Mashel River stream improvement	1968	1	11,000	1969	86
	AFC-25. Green River hatchery pond conversion	1969	1	87,000	1969	55
	AFC-26. Skagit hatchery holding and rearing ponds	1969	1	135,884	1970	56
	AFC-32. Mill Creek fish passage facility	1969	2	16,000	1970	53
	AFC-33. Upper Mashel River stream improvement	1969	1	5,000	1969	86
	AFC-35. Puget Sound resident coho study	1969	1	24,000	1970	106
	AFC-36. Skykomish hatchery concrete pond construction	1969	1	69,000	1970	56
	AFC-37. Stream catalog - Puget Sound and Chehalis region	1969	2	52,000	1971	79
	AFC-39. Upper Chehalis River stream improvement	1969	1	10,000	1970	86
	AFC-40. Design for future program construction	1970	1	67,000	1971	80
	AFC-43. North Fork Newaukum River fish passage	1970	1	15,000	1970	53
	AFC-45. Issaquah hatchery ponds revision	1970	1	95,000	1970	56
	AFC-46. Puget Sound resident coho study	1970	4	82,240	1973	106
	AFC-47. Fall chinook contribution to the fishery	1970	1	8,032	1970	106
	AFC-49. Nemah hatchery holding and rearing pond	1970	1	41,000	1971	56
	AFC-50. Big Beef Creek chum salmon spawning success and fry quality	1970	3	355,590	1973	106
	AFC-51. Design of Humptulips salmon hatchery	1971	1	132,000	1972	80
	AFC-52. Puyallup hatchery pond and pumping plant construction	1970	1	176,636	1971	56

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	AFC-53. Hood Canal pond revision	1971	1	153.000	1971	56
	AFC-54. Minter Creek adult holding and rearing pond	1971	1	90,000	1972	56
	AFC-55. Washington ocean salmon fisheries biological sampling program	1971	3	205,498		106
	AFC-56. 1971 Lake Washington sockeye tagging study	1971	1	13,524	1972	106
	AFC-57. Puget Sound fall chinook tagging study	1971	1	10,498	1972	106
	AFC-58. Hatchery dry feed field tests	1971	2	21,000	1972	106
	AFC-59. Spawning ground improvement - gravel loosening	1971	2	22,000	1973	83
	AFC-60. Coastal stream catalog assembly	1971	2	28,800	1973	80
	AFC-61. Hatchery chinook contribution to the fisheries	1971	2	244,000	1973	106
	AFC-62. Prediction studies, pink and chum salmon	1971	2	40,000		107
	AFC-63. Skagit salmon channel	1972	1	371,000	1972	56
	AFC-64. Skykomish salmon channel construction	1972	3	671,000		56
	AFC-65. Willapa hatchery auxiliary water supply	1973	1	90,000		57
	WEST VIRGINIA					
88-309	3-58-R. Investigations of the commercial potential of fishery resources in West Virginia	1966	3	41,250	1969	90
	3-96-R. Commercial fishery investigations	1969	1	3,600	1970	94
	3-97-R. Mussel investigations	1969	2	61,250	1971	117
	3-128-R. Commercial fishery investigations	1970	3	20,500	1973	94
	3-173-R. Impact of commercial use of wild bait species	1972	3	57,014		87
	WISCONSIN					
88-309	4-7-R. Assessment of lake trout and associated species in Lakes Michigan and Superior	1965	3	115,665	1969	91

(continued)

Public Law	Project number and title	Date initiated	Duration	Estimated total cost	Date completed	Project narrative
		Year	Years	Dollars	Year	Page
	4-41-D. A study of the contribution of bait dealers and private fish hatchery operators to the commercial fish industry of Wisconsin	1968	2	6,000	1969	64
	4-42-D. The alternatives for Lake Superior trout management - a system analysis	1968	1	5,800	1968	128
	4-58-R. Lakes Michigan and Superior assessment studies	1969	3	75,700	1972	111
	4-62-D. Economic aspects of lake trout management in Lake Superior	1969	1	3,750	1970	64
	3-133-R. Status of fish populations in Pool 7 of the Mississippi River and probable effect of gill net fishery	1970	2	12,000	1972	128
	3-166-R. Effects of commercial fishing on winter congregations of catfish	1972	1	8,000		90
	3-169-R. Assessment of whitefish and related species in Lakes Michigan and Superior	1972	3	54,000		92
89-304	AFC-2. Walleye population in respect to a possible commercial fishery	1967	1	15,064	1967	91
	AFC-4. A comparative study of thyroidal, interrenal, and gonadal activity in the alewife	1968	2	14,000	1970	95
	AFC-5. An investigation of the reproductive cycle of the alewife in Lake Michigan	1968	3	55,930	1971	95
	AFC-6. Study of the population dynamics of juvenile alewife and coregonids in Green Bay, Lake Michigan	1968	1	30,577	1969	95
	AFC-8. Evaluation of commercial fishery potential of Wisconsin's boundary waters of Lake Superior	1969	1	2,000	1970	92
	AFC-9. Mucus and osmoregulation in alewife and smelt	1970	2	35,000	1972	95
	AFC-10. Age, growth, and maturity of the smelt in Lake Michigan	1970	1	7,874	1971	107
	AFC-11. Evaluation of food-processing methods for Great Lakes anadromous fish	1971	3	74,598		107
	AFC-12. American smelt and associated species interrelationships in Lake Michigan	1972	3	61,260		107

Public Law	Project number and title	Date initiated Year	Duration Years	Estimated total cost Dollars	Date completed Year	Project narrative Page
	WYOMING					
88-309	1-48-R. The commercial potential of non-game fish species in impounded waters	1968	3	121,616	1971	88
	1-80-R. Feasibility of commercial exploitation of commercial fish species in impoundments	1971	3	85,742		94

PROGRAM ANALYSIS

For program analysis, projects are grouped under the type of activity undertaken rather than by State or Public Law. In doing so, the reader has all projects for a particular segment of the program, such as construction, coordination, planning, or research, in one section.

Under each type of activity included are project identification, principal investigator, current segment cost (both State and Federal) for continuing projects, total cost and year of completion for completed projects, title, and project narrative.

Requests for additional information about a project or for reprints of reports resulting from the work should be made to the appropriate NMFS Regional Office, State Agency, or Cooperator. The Regional Offices, State Agencies, and Cooperators, including addresses, are listed on pages 153-156, inclusive.

AQUACULTURE

Thirty-six projects have been funded, of which 23 have been completed at a total cost (both State and Federal) of $1,941,820, and 13 are at various stages of completion at a total estimated cost of more than $1.5 million. Research emphasis is on cage culture of catfish, pond culture of shellfish, rearing of trout and catfish in silos, and mass culture of abalone and shellfish.

Alabama 2-86-R — Walter M. Tatum — Completed 1973 — $92,200

Experiments in the culture of marine species in floating baskets - The purpose of this project was to experiment with floating basket culture of marine finfish, particularly pompano in estuarine areas. Experimental procedures for raising finfish included the use of oysters and shrimp as biofactors to improve water quality and provide additional harvest.

Arkansas 4-49-R — Richard A. Collins — Completed 1970 — $14,000

Rearing single and multiple species populations of catfish in cages - The application of cage-rearing techniques to large reservoir lakes and smaller private lakes was the purpose of this study. Channel and blue catfish were stocked in the same cage and in individual cages to determine growth, oxygen levels, food conversion, and behavior of mixed populations. State College of Arkansas made this study at Lake Beaverfork.

Arkansas 4-67-D — Richard A. Collins — Completed 1971 — $20,910

Cage culture of fish in reservoirs - Four different designs of cages varying in depth and surface area were planted with uniformly graded fingerling catfish to determine the effect of grading on differential growth within a cage.

Arkansas 2-133-R — Richard A. Collins — Completed 1971 — $5,340

Culturing of trout in cages - Fingerling rainbow trout were stocked in cages in a warmwater reservoir during fall, winter, and spring months to determine rate of growth and feed conversion.

Arkansas 2-148-R — Richard A. Collins — Completed 1972 — $12,820

Efficacy of prophylactic treatments on caged catfish and investigation of cage construction materials - This project was undertaken to explore the feasibility of prophylactic treatments, including formalin dips and others, in culture of channel catfish commercially in cages.

California 6-4-R — Shyrl Hood — Completed 1972 — $738,300

Shellfish laboratory operations - This project provided for research on development of mass culture methods for abalone, clams, crab, oysters, and shrimp.

California 4-20-R | Earl E. Ebert | $91,900

Mariculture research and development - This study is a continuation of research conducted under project 6-4-R for development of mass culture techniques for abalone, crab, shrimp and other shellfish, and to develop a disease-resistant strain of Pacific oyster. The research is done at the State's Marine Culture Laboratory at Granite Canyon, Monterey County.

Florida 2-113-R | Karen Staidinger | $100,000

Development of specialized mariculture techniques on species of high potential - Methods for spawning and rearing brackish-fresh water shrimp, Florida pompano, and other finfish are investigated at Florida Department of Natural Resource's Marine Research Laboratory, St. Petersburg.

Georgia 2-84-R | James W. Andrews | Completed 1970 $105,000

A study of the nutritional, physiological, and economic requirements for the production of channel catfish in an intensive running water culture - This study at Skidaway Institute of Oceanography, University of Georgia, was designed to evaluate the interactions of environmental and dieting factors on growth, health, body composition, and economic aspects of channel catfish production. Environmental variables included water flow, aeration, stocking.

Georgia 2-117-R | Robert R. Stickney | Completed 1971 $10,000

Catfish fingerling production under intensive running water conditions - The purposes of this project were to determine optional stocking density in intensive culture conditions in order to obtain optimal growth from fry to fingerling size and to update present catfish spawning methods to coincide with the needs of the intensive cultural methods.

Georgia 2-172-R | James W. Andrews | $43,750

The requirements of catfish for several nutritional and physiological variables - This is a followup of project 2-84-R and will obtain additional information on catfish dietary requirements, determine the effects of certain environmental conditions on growth, and estimate the optional stocking densities for rearing fry to fingerlings in high-density culture.

Hawaii H-1-D | Takuji Fujimuru | Completed 1969 $88,379

Development of a prawn fishery - Laboratory findings indicated that the prawn, Macrobrachium rosenbergi, can be held successfully for an indefinite period in tanks. The species will reproduce in captivity, and the larval stages can survive in the laboratory. The selection, introduction, and establishment of prawns suitable for mass culture and the development of culturing techniques that will lead to a commercial prawn-raising industry was investigated. The research was at the Keehi Fishery Station, Division of Fish and Game, Honolulu.

Hawaii H-14-D | Takuji Fujimuru | Completed 1972 $135,375

Development of a prawn culture industry - The purpose of this project was to develop practical means for commercial culture of the giant freshwater prawn through modification of facilities and techniques used heretofore. Formulation of effective and economical prawn foods was undertaken also.

Hawaii 4-24-D | Takuji Fujimuru | $52,000

Development of a prawn culture industry in Hawaii - This study is undertaken to reduce production cost for producing juvenile prawns in hatcheries. Reduction in production cost will be attempted by mechanizing labor-intensive jobs, developing an inexpensive feed to replace costly fresh fish flesh, reducing rearing time by manipulating temperature, and reducing mortality by filtering rearing water.

Colorado 6-11-D | Stephen A. Flickinger | Completed 1973 $87,000

Culture of fishes with commercial importance - The objectives of this study were to explore cultural methods for the propagation of bait fish and to investigate hormonal sex control to enhance bait fish culture.

Idaho 1-57-D — Delbert Ledington — $25,300

Test rearing of anadromous fish, Lemhi River drainage - The feasibility of pond rearing spring chinook salmon and summer steelhead trout to release size in the same facility utilizing controlled water temperature in 1 year is evaluated at the Hayden Creek rearing station on Lemhi River.

Illinois 4-32-R — William M. Lewis — Completed 1969 $31,793

Feeding-out catfish in cages - The Southern Illinois University conducted this project to determine the feasibility of stocking yearling channel catfish in cages in infertile lakes such as stripmine lakes and producing marketable size fish by feeding them daily.

Illinois 4-33-R — William M. Lewis — Completed 1969 $31,300

Investigation of problems associated with the confinement of warmwater fishes in holding tanks - The purposes of this study were to determine whether oxygen levels affect the occurrence of epizootics of pathogens in holding tanks and whether temperature manipulation may control the epizootics. Fisheries Research Laboratory of Southern Illinois University, Carbondale, did this work.

Illinois 4-51-R — William M. Lewis — Completed 1971 $25,380

Considerations in the commercial production of channel catfish in cages - Channel catfish were reared in cages anchored in ponds at Southern Illinois University to determine the carrying capacity of different size ponds, optimum number of fish per cubic yard, optimum cage depth, value of mechanical aeration, and variations in fish growth.

Illinois 3-165-R — William M. Lewis — $17,600

Stabilization of environmental conditions in fish production ponds - The objective of this study is to demonstrate that the prevention of microstratification will produce more stable conditions in warmwater fish production ponds, such as those currently used in the production of fed populations of channel catfish.

New Mexico 6-20-R — John W. Hernandez — Completed 1973 $57,500

Vertical raceways and water re-use as a means of maximizing commercial trout production - The purpose of this project was to determine if vertical raceways, effluent purification, and re-use of effluent treated water will increase rainbow trout production in hatcheries at an acceptable cost/benefit level versus common trout pond culture.

New York 3-63-R — Arthur Brand — Completed 1973 $214,320

Pond culture of oyster seed in a controlled natural environment - Oyster Pond, in East Hampton, Long Island, was the center of this study. Samples on a semiweekly basis were collected and analyzed to determine the biological, physical, and chemical characteristics of the pond. Data on intensity of spawning, setting, and survival were also obtained from spat set on hard bottom areas and rafts.

New York 3-101-R — Robert C. Batson — $17,000

A study of bay scallop growth during fall, winter, and spring in heated salt water - The objective is to determine the usefulness of heated discharge water from power stations and desalination plants in promoting bay scallop growth.

North Dakota 4-71-R — James Reilly — Completed 1971 $7,000

Cage culture of black bullhead - This project was undertaken at the State-owned Spiritwood Lake fish hatchery to determine the growth rate of black bullhead produced on a commercial diet and the feasibility of the commercial production of the species by cage culture.

North Dakota 1-83-R — James Reilly — $4,000

Investigation of cage culture of rainbow trout - This study will determine the growth rate of rainbow trout reared in cages in Hooker Lake during a 180-day rearing period. After cage rearing, the fish will be subjected to flesh analysis, tagged, and released in the lake. Recaptures will be examined for changes in flesh, and growth rate determined.

Oregon 1-60-R — Wallace F. Hublou — Completed 1973 $52,000

Clam-oyster-abalone larval rearing - The purpose was to develop techniques for mass culturing clams, oysters, and abalone to assess the feasibility of artificial propagation as a supplement to natural production.

Oregon 1-66-R — C. Dale Snow — Completed 1971 $15,500

Crab larval rearing - Dungeness crab larvae were challenged to different current velocities and light intensity to gain information for development of techniques for sampling larvae at sea.

Oregon AFC-43 — Louis Bowen — Completed 1970 $22,300

Pink and chum salmon culture - This project was carried out by the Oregon State University and provided for completion of an experimental field station located on Netarts Bay. The station will be used for testing a hatchery concept for increasing production for chum, chinook, and coho salmon in small coastal streams as a water source which is insufficient for natural spawning channels.

Oregon AFC-55 — William J. McNeil — Completed 1972 $20,000

Culture of salmon acclimated to sea water - The project was research on new techniques for the artificial culture of salmon at Oregon State University's Netarts Bay Laboratory. It included pilot production of juvenile salmon for direct release into marine waters, testing of prototype hatchery system for producing salmon acclimated to sea water, hybridization of salmon to obtain fish which adjust readily to sea water as fry, and other related studies.

Pennsylvania 3-110-R — Arthur Bradford — $12,081

A study of the production of warmwater fish species in a vertical fish rearing facility - Purpose of this study is to investigate the feasibility of rearing warmwater fish in a vertical rearing unit (silo) with special emphasis on channel catfish.

Pennsylvania 3-112-R — Shyrl Hood — $22,001

Rearing trout in silos arranged in series - The purpose of this study is to design a series of silos which will have suitable conditions for increasing the production of trout per unit of flow.

Puerto Rico 2-163-R — Francisco A. Pagan — $50,000

The development of cultures of the channel catfish and Tilapia species in Puerto Rico - This project is an attempt to develop cultures of channel catfish and Tilapia species for introduction to the Island of an additional source of protein and an income for potential aquafarmers. Potential production in ponds, raceways, and cages at different water levels and flow will be evaluated.

Puerto Rico 2-184-R — Kenneth W. Walters — $52,600

Investigation on the aquaculture potential of marine organisms - Suitability of selected marine fish and invertebrates for aquaculture is investigated. Also, techniques for commercial rearing will be studied.

South Carolina 2-3-R — G. Robert Lunz — Completed 1969 — $34,160

To manage and practice aquaculture in shrimp farm ponds and in large tanks under controlled conditions - Experiments at Bears Bluff Laboratory, Wadmalaw Island, beginning in 1947 have shown that it is possible to culture shrimp from postlarval stages to mature adults in shallow ponds constructed in saltwater marsh. Under this project, shrimp culture was continued in 3,000 gallon tanks in which the environment can be controlled. Attempts were made to hatch brown shrimp eggs and rear them through the larval stages.

Tennessee 2-144-R — Harold Hurst — Completed 1973 — $24,020

Production of channel catfish in cages - Cages were stocked with various numbers of 5-inch channel catfish fingerlings with daily feedings of some lots of complete floating feed, and others are fed with trout pellets for varying number of days to determine optimum production conditions. The effects of repeated noises and other disturbances on growth rate of the caged fish were observed also.

Texas 2-78-R — Larry Elam — Completed 1971 — $183,820

Saltwater pond research - This project used 21 ponds constructed at the saltwater pond experiment station near Palacios under project 2-14-C to develop and expand mariculture practice and procedures. A variety of fish and shellfish were reared under various artificial ecological conditions. Chemical and physical factors were measured to determine the effects on growth and survival of the different species.

Texas 2-169-R — Larry Elam — $83,404

Saltwater pond research - Study #2 - Shrimp, oyster, redfish, black drum, and spotted trout will be reared in an artificial environment to improve on techniques for pond conditioning, disease control, and growth and feeding.

CONSTRUCTION

Eighty-two construction projects have been initiated, of which 71 have been completed at a total cost of more than $13.5 million, and 11 are continuing at various stages of completion at an estimated total cost of more than $3.5 million. Emphasis has been on construction of salmon hatcheries, fish screens, and research laboratories and vessels.

FISH CULTURE FACILITIES

Seven facilities, mainly for shellfish culture, have been completed at a total cost of $282,995.

Alabama 2-31-C — Johnie H. Crance — Completed 1968 — $7,560

Oyster rearing pond construction - A ½-acre pond was constructed adjacent to the Alabama Marine Resources Laboratory on Dauphin Island to study commercial rearing of oysters in saltwater ponds.

California 6-12-C — C.S. Kabel — Completed 1971 — $32,000

Shellfish laboratory - water supply construction and electrical power installation - Provided for construction of sea water supply and drain system and electrical service unit for the State-owned shellfish laboratory on Granite Creek, Monterey County.

Louisiana 2-63-C — J.D. Broom — Completed 1968 — $92,935

Construction of saltwater culture ponds - Sixteen ½-acre ponds were constructed on Grand Terre Island, Jefferson Parish, near the Louisiana Wild Life and Fisheries Commission marine laboratory. The ponds are used for culture of brown and white shrimps, as well as oysters and selected fishes.

Massachusetts 3-39-C — A. Russell Ceurvels — Completed 1967 — $30,000

Cat Cove dike - A water level control system was installed at the 8-acre Cat Cove impoundment so that the pool could be used for shellfish culture studies. The impoundment is on Salem Harbor in Salem, near the proposed site for a marine fisheries laboratory.

Massachusetts 3-52-C — A. Russell Ceurvels — Completed 1968 — $54,000

Cat Cove pier and pool - Shellfish floats were installed at the Cat Cove impoundment pier, and the bottom of this 8-acre pool was stabilized to make the area suitable for the culture of shellfish. The impoundment is on Salem Harbor in Salem, near the proposed site for a marine fisheries laboratory.

Nebraska 4-17-D — Robert E. Thomas — Completed 1967 — $54,000

Design and construction of facilities relative to trapping and handling of commercial fish - Live-holding facilities for research on commercial fish in the North Platte River were constructed near Lewellen. Also, an electrical fish weir and trap were installed to observe movement and availability of fish.

Washington 1-49-C — Russel D. Webb — Completed 1969 — $12,500

Bivalve larvae experimental rearing pond construction - A lined concrete pond was constructed at the Point Whitney Shellfish Laboratory on Dabob Bay, Hood Canal. Because of a chronic shortage of Pacific oyster seed, this pond will be used to develop mass culture procedures which would be expanded to meet special needs of the commercial shellfish growers.

FISH LANDING FACILITIES

Three projects have been initiated to facilitate landing of oysters in Alabama and landing and handling of fish in Puerto Rico. Two of the projects have been completed at a total cost of $263,000, and one 3-year project is continuing at an estimated total cost of $400,000.

Alabama 2-29-C — Johnie H. Crance — Completed 1967 — $13,000

Construction of public oyster landing facilities - Three public oyster landings were constructed on Heron Bay, Baldwin County. The landings enable oystermen to unload their catch in a protected area and close to the oyster-processing shops.

Puerto Rico 2-41-C — Rolf Juhl — Completed 1971 — $250,000

Construction of fishing port facilities - This project provided for construction of essential fishing port facilities at Barrero at Rincon, Puerto Nuevo at Vega Baja, Cerro Gordo at Vega Alta, Culebra Island, Punta Santiaga at Humacao, and Hucares at Naguabo to facilitate and stimulate the fishing activity.

Puerto Rico 2-158-C — Angel Negrón Dóvila — $140,000

Construction of commercial fishing facilities - This is a continuation of project 2-41-C and provides for construction of additional landing, handling, and storing facilities at fishing ports in the Islands to upgrade present conditions and to promote an increase in fisheries production and utilization.

FISH SCREENS AND STREAM IMPROVEMENT FACILITIES

Seventeen projects have been initiated, of which 4 constructed fish screens on California streams at a total cost of nearly $3 million and 9 are for stream improvement through laddering or removal of barriers to fish passage at an estimated total cost of nearly $1 million.

California AFC-6 — C.S. Kabel — Completed 1967 — $70,000

Scott Valley fish screen construction - Fish screen and trapping facilities were installed at the Scott Valley Irrigation District Diversion Canal to prevent losses of downstream migrant coho and chinook salmon and steelhead trout to the canal from the Scott River near Fort Jones, Siskiyou County.

California AFC-9 — John Radovich — Completed 1971 — $225,000

Banta-Carbona fish screen construction - A fish screen was constructed at Banta-Carbona Irrigation Diversion to prevent losses of downstream migrant chinook salmon to the diversion from San Joaquin River. The construction site is near Diablo, San Joaquin County.

California AFSC-10 — James F. Keating — Completed 1972 — $2,540,000

Glenn-Colusa fish screen construction - Provided for construction of a fish screen to prevent loss of downstream migrant salmonids in the irrigation diversion of the Glenn-Colusa Irrigation District from the Sacramento River near Hamilton City, Glenn County.

California AFC-11 — C.S. Kabel — Completed 1971 — $90,000

El Solyo fish screen construction - Provided for construction of a fish screen to prevent loss of downstream migrant salmonids in the irrigation diversion in the El Solyo Irrigation District from the San Joaquin River near Vernalis, Stanislaus County.

Delaware AFSC-3 — Charles A. Lesser — Completed 1972 — $120,000

Shad passageway construction on the Brandywine River - Fish passage facilities were constructed on 11 low-head dams on Brandywine Creek, tributary to Delaware River. Passage facilities at all obstructions will make available about 35 miles of spawning and nursery areas to anadromous fish, principally American shad.

Delaware-Pennsylvania AFSC-4 — Robert A. Beck — $9,500

Restoration of shad runs in the Brandywine Creek and its tributaries - Results of a recently completed project indicated that the Brandywine Creek above impoundments was suitable for hatching shad eggs and that adult shad moved upstream through passage facilities provided at the first two obstructions. This project will continue construction of passage devices at upstream obstructions. Concurrent with the construction, spawning success of passed fish will be evaluated. Additionally, fertilized shad eggs will be collected from other runs and planted in the stream.

Maine AFC-6,15 — Lewis N. Flagg — $58,000

Fishway construction and stream improvement - The purpose of this project is to increase production and landings of commercial anadromous species in Maine through a fishway construction and stream improvement program.

Maryland AFC-3 — C.J. O'Dell — Completed 1970 — $218,272

Stream improvement program for anadromous fish management - Fish passage facilities were constructed and hazards removed to enhance the upstream migration of anadromous fish in the Nanticoke, Birch, Gunpowder, and Chester Rivers.

Massachusetts AFC-1 | Clinton Watson | Completed 1971 $80,000

Anadromous fish investigations - Fish passage needs for upstream movement of river herrings and American shad have been surveyed on coastal streams. Construction of passage facilities is underway on streams in Bristol and Barnstable Counties.

Massachusetts AFCS-9 | Joseph DiCarlo | $95,000

Anadromous fisheries development - This project provides for plans, designs, modifications, and construction of fish passage facilities in coastal streams in an effort to restore and establish new runs of anadromous fish.

New Hampshire AFC-1 | Allen I. Lewis | Completed 1972 $280,000

Commercial fisheries development - To construct fish passage facilities at the first dam upstream from tidewater on the Exeter River, Rockingham County, for the upstream passage of alewife and American shad.

Oregon AFC-25 | Austin Magill | Completed 1968 $10,000

Remove culvert and construct bridge to provide anadromous fish passage on Clear Creek tributary to the Kilchis River - A culvert was removed and replaced with a precast concrete slab and wood piling bridge across to permit upstream passage of chinook, chum, and coho salmon in Clear Creek near Tillamook, Tillamook County.

Oregon AFC-35 | Austin Magill | Completed 1969 $31,500

Provide passage for salmonids on Oregon coastal streams - Nine logjams and other obstructions were removed on Oregon coastal streams to provide access to 62 miles of spawning and nursery areas for salmonids. A "steep-pass" type fishway was constructed and six were repaired and modified to maintain passage of salmonids to about 60 miles of fish habitat and one salmon hatchery.

Rhode Island AFSC-1 | John M. Cronan | $40,000

Construction of fish ladders - To construct fish ladders and/or removal of obstructions to provide upstream passage of alewife, American shad, and sea-run trout in Hunt River, Kent County, Annaquatucket River, Washington County, and Saugatucket River, Washington County.

Washington 1-21-C | Robert Kramer | Completed 1967 $28,000

Construction of small fishway - Fishway was constructed and logjam removed on Hutchins Creek, tributary of Nooksack River in Whatcom County, to make available additional spawning and rearing areas to fall chinook and coho salmon.

Washington AFC-32 | Marshall Thayer | Completed 1970 $16,000

Mill Creek fish passage facility - Provided for construction of a fish passage facility through a 9-foot falls in Mill Creek, tributary to the Bogachiel River, to open up about 5 miles of spawning and nursery areas to coho salmon. The site is near Forks in Clallam County.

Washington AFC-43 | Marshall Thayer | Completed 1970 $15,000

North Fork Newaukum River fish passage - Adequate passage facilities were installed at a falls-cascade area to permit upstream passage of migrant coho salmon to about 9 miles of spawning and nursery area on the North Fork Newaukum River.

HATCHERIES AND HATCHERY FACILITIES

Five projects have been initiated for construction of three salmon hatcheries on the west coast, one salmon hatchery in New Hampshire, and one striped bass hatchery in Alabama at a total cost of nearly $6 million. Rearing ponds or spawning channels have been or are being constructed at 15 State-owned hatcheries at an estimated total cost of about $3 million.

Alabama AFCS-5 — Wayne E. Swingle — $82,000

Construction of an anadromous fish hatchery and rearing facility - This project is undertaken to acquire property and construct facilities for spawning, hatching, holding, and rearing striped bass and other anadromous fish.

California AFSC-1 — Alex Calhoun — Completed 1972 $2,684,250

Mad River hatchery construction - A salmon and steelhead trout hatchery with water reconditioning system was constructed on the Mad River near Arcata, Humboldt County. When fully operative the hatchery will have potential annual production of 1 million yearling coho salmon and 5 million yearling chinook salmon.

California AFC-3 — C.S. Kabel — Completed 1971 $40,000

Mad River hatchery fish ladder (formerly Casper Creek egg-taking station) - Fish passage facility was constructed to provide entry of adult chinook and coho salmon and steelhead trout into egg-taking station of Mad River hatchery. (See California AFSC-1)

Idaho 1-9-C — James F. Keating — Completed 1969 $65,324

Construction of Hayden Creek rearing pond - Two 1-acre ponds and related facilities for rearing chinook salmon and steelhead trout were constructed at an abandoned trout hatchery on Hayden Creek, tributary to the Lemhi River.

Idaho 1-51-C — James F. Keating — Completed 1971 $30,200

Construction of facilities at Hayden Creek ponds - Provided for construction of feed and equipment storage sheds at Hayden Creek rearing ponds constructed in 1969 under project 1-9-C.

New Hampshire AFC-2 — State Engineers — $900,000

Anadromous salmon hatchery construction - Provides for design and construction of a salmon hatchery on the Soughegan River, Hillsboro County, for the production of Atlantic and coho salmon. The station will be capable of producing about 500,000 salmon smolts annually.

Oregon AFC-11 — Ernest R. Jeffries — Completed 1968 $172,000

Rearing ponds, North Nehalem River salmon hatchery - Six additional rearing ponds for yearling coho and fall chinook salmon and a three-bedroom residence were constructed at the State-owned North Nehalem River salmon hatchery in Clatsop County.

Oregon AFC-17 — Jim Von Domelen — Completed 1968 $476,000

Construction of the Elk River salmon hatchery - The hatchery was constructed on the Elk River in Curry County. It was put into operation in the fall of 1968 and is now rearing about 2 million coho and fall chinook annually for release in the State's southern coastal drainages.

Oregon AFC-40 — Edward K. Neubauer — Completed 1970 $228,000

Construct supplemental rearing pond adjacent to Trask River salmon hatchery - Provided for construction of ½-acre dirt pond with water supply and fish handling facility for rearing salmon and steelhead trout at the Trask River salmon hatchery on the East Fork of Trask River, Tillamook County.

Oregon AFC-59 — Edward K. Neubauer — Completed 1971 — $221,344

Expansion of Elk River hatchery - Provided for construction of an additional 10 rearing ponds and supporting facilities for production of fall chinook, coho, or steelhead trout. The additional ponds increased the rearing capacity of the hatchery from 1 million to 1,700,000 fish.

Oregon AFC-62 — Ernest R. Jeffries — Completed 1972 — $15,000

Construct a short-term rearing pond at the Trask River salmon hatchery - Provided for construction of a rearing pond for initial rearing of about 1.5 million juvenile coho salmon to a size of about 500 fish per pound.

Oregon AFC-66 — E.K. Neubauer — $15,000

Electrical barrier - North Nehalem hatchery - The purpose of this project is to construct an electrical barrier across the North Nehalem River adjacent to the State-owned North Nehalem salmon hatchery. The barrier will be used to divert upstream migrant salmon into holding pens for examination and counting.

Washington 1-50-C — Marshall Thayer — Completed 1970 — $67,662

Samish hatchery concrete pond construction - Provided for construction of four additional concrete ponds which added about 24,000 pounds of juvenile salmon annually to the production of the State-owned Samish hatchery near Burlington.

Washington AFC-5 — Pursell D. Watt — Completed 1970 — $1,666,000

Construction of Soleduck salmon hatchery - A salmon hatchery was constructed on the Soleduck River in Clallam County. When fully operative the hatchery will have a potential annual production of about 115,500 pounds of young salmon, which is calculated to yield about 58,000 salmon (435,000 pounds) to the fishery.

Washington AFC-9 — Marshall Thayer — Completed 1969 — $98,000

Samish salmon hatchery supplemental water supply and rearing pond system - Pump and transport facilities for supplemental hatchery well water supply and denitrification tower were installed at the State-owned Samish salmon hatchery near Burlington. Also, a rearing pond was constructed.

Washington AFC-15 — Marshall Thayer — Completed 1969 — $30,000

Nooksack hatchery coho yearling pond construction - A ½-acre yearling coho salmon rearing pond was added to the Nooksack State salmon hatchery located about 20 miles northeast of Bellingham, Whatcom County.

Washington AFC-16 — R.D. Webb — Completed 1969 — $92,000

Simpson hatchery rearing pond - At the State-owned Simpson salmon hatchery on the Satsop River, Grays Harbor County, an additional rearing pond was constructed for fall chinook and yearling coho salmon.

Washington AFC-17 — Melvin Eby — Completed 1969 — $22,000

Issaquah hatchery yearling coho rearing pond construction - To extend the time yearling coho salmon can be reared, a new rearing pond was added to the State-owned Issaquah hatchery located in King County.

Washington AFC-25 — Marshall Thayer — Completed 1970 — $87,000

Green River hatchery pond conversion - Four dirt bottom salmon rearing ponds were converted to eight concrete ponds, and the water systems were modified to accommodate the revised ponds. The work was at the State-owned Green River hatchery on the Big Soos Creek.

Washington AFC-26	Marshall Thayer	Completed 1970 $135,884

Skagit hatchery holding and rearing pond - This project provided for modification and enlargement of a dirt rearing pond to increase production of coho and fall chinook salmon at the State-owned Skagit hatchery on North Puget Sound, Skagit County.

Washington AFC-36	Russell K. Jones	Completed 1971 $69,000

Skykomish hatchery concrete pond construction - This project provided for construction of a series of ponds at the Skykomish hatchery, Skykomish County. The additional ponds increased annual hatchery production by 24,000 pounds.

Washington AFC-45	Marshall Thayer	Completed 1970 $95,000

Issaquah Hatchery ponds revision - Provided for asphalt lining of two existing dirt ponds and new concrete outlet structures at the State-owned Issaquah salmon hatchery, King County.

Washington AFC-49	Russell Webb	Completed 1971 $41,000

Nemah hatchery holding and rearing pond - Provided for enlargement and modernization of an existing dirt pond to a 1/3-acre asphalt-lined combination salmon adult holding, spawning, and juvenile rearing pond to increase station output.

Washington AFC-52	Russell Webb	Completed 1971 $179,636

Puyallup hatchery pond and pumping plant construction - To increase rearing capacity of the State-owned Puyallup salmon hatchery, four new concrete ponds, two new ¼-acre asphalt-lined ponds, and a combination fishway and pumping station were built at this station which is located near Orting, Pierce County.

Washington AFC-53	Russell Webb	Completed 1971 $153,000

Hood Canal pond revision - Existing releasing area was rebuilt into an adult holding pond to permit species segregation and to provide a pond for off-season juvenile salmon rearing which increased this State-owned hatchery at Hoodsport (Mason County) output 15,000 pounds of chinook salmon annually.

Washington AFC-54	Russell Webb	Completed 1972 $90,000

Minter Creek adult holding and rearing pond - Provided for construction of a 50- by 180-foot asphalt-lined adult salmon holding facility which also will be used seasonally for juvenile rearing to increase the Minter Creek salmon hatchery (Pierce County) by an estimated 20,000 pounds of chinook salmon annually.

Washington AFC-63	State Engineers	$371,000

Skagit salmon channel construction - Provides for facilities to increase production of pink, chum, chinook, and coho salmon at the Skagit Hatchery near the confluence of Clark and Jordan Creeks with the Cascade River, Skagit County.

Washington AFC-64	State Engineers	$82,000

Skykomish salmon channel construction - Provides for facilities and water to increase the production of pink, chum, chinook, and coho salmon at the Skykomish Hatchery near Startup, Skykomish County.

Washington AFC-65 R.K. Jones $90,000

Willapa hatchery auxiliary water supply - Install a new pumping station at the State-owned Willapa hatchery near Raymond, Washington, to increase station water flow by an immediate 8 c.f.s., and an eventual increase of 24 c.f.s. The 8 c.f.s. increase in flow will increase station output by 52,000 pounds of coho and chinook salmon, which will have total annual benefit of $365,000 to the fishery.

LABORATORY

Seventeen projects for laboratory construction and equipment or improvement have been initiated and completed. Laboratories were constructed by five States and Puerto Rico at a total cost of $2,155,350, and four State-owned laboratories were provided equipment or improvements at a total cost of $89,420. Federal share of the project costs was generally 50 percent.

Maine 3-72-C Phillip L. Goggins Completed 1968
$ $4,000

Laboratory and tank room construction - This project provided for construction and installation of needed equipment for investigators to carry out P.L. 88-309 projects at the State's Fisheries Research Station, Boothbay Harbor.

Maine 3-83-C Richard P. Choate Completed 1970
$124,000

Marine research laboratory construction - The first unit of new marine research laboratory was constructed at Boothbay Harbor. The two-story building consists primarily of office space, dry laboratories, and related space to carry out research studies on lobster, marine worms, and shrimp.

Maine AFCS-9 Richard P. Choate Completed 1972
$200,000

Phase II - marine research laboratory construction - The objective of this project was to construct the second phase of new marine research laboratory facilities at Boothbay Harbor.

Massachusetts 3-74-C A. Russell Ceurvels Completed 1972
$400,000

Marine research laboratory construction - This project provided for construction of a marine research laboratory and installation of needed equipment at Cat Cove, Salem. The single-story structure will be about 60 feet by 90 feet and will provide research space for shellfish larviculture.

Mississippi AFCS-2 Thomas D. McIlwain Completed 1970
$50,000

Anadromous fish laboratory construction - This project provided for construction of an anadromous fish research laboratory at the Gulf Coast Research Station in Ocean Springs and for the installation of needed equipment destroyed in Hurricane Camille.

New York 3-10-C David H. Wallace Completed 1969
$383,000

Construction of a marine research and development laboratory - A seaside laboratory equipped with a saltwater system and other essential utilities was constructed in the village of Old Field, adjacent to Flax Pond, which is a saltwater estuary off Long Island Sound.

Puerto Rico 2-40-C Rolf Juhl Completed 1970
$250,000

Construction of commercial fisheries laboratory - This project provided for construction of a laboratory and center for biological studies, exploratory fishing, gear research, technology studies, and economic and statistical studies for the research and development of commercial fisheries of Puerto Rico. This facility is located in Mayaguez, relatively close to the Puerto Rico College of Agriculture and Mechanic Arts, the Inter-American University, and the Institute of Marine Biology.

Puerto Rico 2-98-C — Rolf Juhl — Completed 1971 $199,250

Construction of commercial fisheries laboratory facilities - Provided for construction of commercial fisheries laboratory building foundation and a roadway linking the laboratory with the main highway on Guanajibo Point south of Mayaguez. The laboratory was partly constructed under project number 2-40-C.

Puerto Rico 2-136-D — Rolf Juhl — Completed 1972 $22,100

Acquisition of general use equipment for a fishery laboratory - Equipment, including water supply and pumping facilities and furniture, was purchased for new commercial fisheries research laboratory which was constructed under the program. The laboratory is located at Punta Guanajibo, Cabo Rojo.

Puerto Rico 2-147-C — Rolf Juhl — Completed 1971 $29,270

Commercial fisheries laboratory facilities, equipment, and incidental expenditures - This project provided for construction of a fence and purchase of accessway facilities and equipment at the research laboratory constructed under P.L. 88-309 at Punta Guanajibo, Cabo Rojo.

Rhode Island 3-79-C — John M. Cronan — Completed 1968 $4,000

Wickford marine laboratory dock - To assure adequate and safe facilities for marine fisheries research, additional sections of the dock which support laboratory tanks and sundry equipment were installed. The laboratory is located in North Kingston.

South Carolina 2-36-C — G. Robert Lunz — Completed 1967 $2,110

To add a refrigerating unit to existing system for temperature control of saltwater culture tanks - Refrigerating units to control temperature were installed in six large-volume experimental saltwater tanks used for research in pond cultivation of shrimp and supplementary feeding of oysters at Bears Bluff Laboratory.

Texas 2-14-C — Terrance R. Leary — Completed 1969 $514,000

Coastal fisheries experiment station - This station was constructed on north shore of Matagorda Bay near Well Point, Calhoun County. It consists of the station, 21 ponds, and related structures to provide controlled habitat for marine research and demonstration. The ponds range in size from ¼-acre to 4 acres.

Texas 2-77-C — Terrance R. Leary — Completed 1969 $24,770

Construction of storage building, coastal fisheries experiment station - A storage building of about 1,600 square feet was designed and constructed on the site of the saltwater pond experiment station near Palacios. This structure will provide space for storage of fish food, vehicles, equipment, and limited office space.

Texas 2-99-C — Terrance R. Leary — Completed 1969 $5,130

Fence construction, Coastal Fisheries Experiment Station - Provided for construction of approximately 2,030 feet of 6-foot chain link fence along the county roadside of the Coastal Fisheries Experiment Station constructed under project 2-77-C near Palacios.

Texas 2-122-C — Terrance R. Leary — Completed 1971 $33,140

Jetty construction, marine fishery research station - Provided for construction of permanent jetties to afford protection to channels providing water and access to the Coastal Fisheries Experiment Station, which was constructed under the Commercial Fisheries Research and Development Act.

RESEARCH VESSELS

Research vessels and/or workboats that have been constructed or acquired in five States, American Samoa, and Puerto Rico have greatly increased their research capabilities. The total project cost was $396,400.

American Samoa H-16-C — Stanley N. Swerdloff — Completed 1971 — $85,000

Acquisition of multi-purpose research vessel - Provided for acquisition of a 50-foot vessel for research projects including pelagic and bottom fish surveys, exploratory fishing, and gear appraisal.

American Samoa H-17-D — Stanley N. Swerdloff — Completed 1972 — $10,000

Acquisition of a prototype demonstration fishing vessel for American Samoa - A small fishing vessel to be used to demonstrate fisheries methods, potential, and benefits to trainees was acquired.

Georgia 2-35-C — Charles M. Frisbie — Completed 1968 — $50,860

Research vessel construction - Plans and specifications for construction of a vessel for conducting research on commercial fish species along the coast were completed. However, due to unavailability of construction funds, a modified trawler was purchased for the stated purpose.

Massachusetts 3-76-C — Frank Grice — Completed 1969 — $40,000

Marine research vessel acquisition - A 40-foot vessel was purchased for research on lobster and winter flounder in coastal waters. The vessel is equipped with radio communication, electronic sounding and navigation gear, and various types of research equipment.

Montana 1-20-C — James H. Posewitz — Completed 1967 — $20,000

Construction of fishery research vessel for Fort Peck Reservoir fishery investigations - A 35-foot vessel was constructed for research on fish of commercial potential, such as the goldeye, sucker, carp, and catfish, in Fort Peck Reservoir in northeastern Montana.

New Hampshire 3-122-D — Richard G. Seamans, Jr. — Completed 1971 — $20,000

Acquisition of marine workboat - Provided for acquisition of a boat of a type and size to allow for the safe and efficient conduct of marine research and development projects in coastal waters.

North Carolina 2-51-C — James Sterling — Completed 1968 — $25,000

Equipping exploratory fishing vessel - The following equipment was installed on North Carolina's new research vessel Dan Moore for exploratory fishing at sea: "Capac" impressed current system for corrosion control, air conditioning system, refrigeration equipment for two insulated fish holds, and outriggers for "double-rigging."

North Carolina 2-73-C — James Sterling — Completed 1968 — $16,000

Equipping exploratory fishing vessel to increase research capabilities - The following equipment was purchased: Simrad fish scope, bathythermograph, winch and davit, midwater trawl, and shrimp pots.

Puerto Rico 2-38-C — Rolf Juhl — Completed 1968 $7,240

Design and construction of an improved fishing boat - An improved fishing boat about 60 feet in length was constructed for research on the local commercial fishery.

Texas 2-13-C — Henry W. Compton, Jr. — Completed 1967 $122,300

Construction of a Gulf research vessel - This 72-foot steel hull shrimp trawler, Western Gulf, was delivered in the spring of 1967. It is currently used in studying shrimp and industrial fish resources of the Texas coast.

COORDINATION

Sixteen coordination projects have been funded in 11 States and Puerto Rico for administration, including planning, coordinating, and supervisory project work, of Public Law (P.L.) 88-309 and P.L. 89-304. Of the projects funded, 8 have been completed at a total cost (both State and Federal) of $385,100, and 8 are continuing at various degrees of completion at a total estimated cost of $2,039,198. Fiscal year 1973 cost is $385,100, of which the Federal share is usually 75 percent.

Alaska 5-1,15,26-S — Gary Finger — $44,000

Coordination and planning - Provides for administration of P.L. 88-309 projects 1966-74.

Alaska AFC-11,36 — Gary Finger — $104,400

Coordination - Provides for administration of P.L. 89-304 projects 1967-73.

California 6-5,16-S — Stanley Kabel — $36,700

Coordination - Provides for administration of P.L. 88-309 projects 1966-73.

Connecticut 3-33-S — Richard L. Hames — Completed 1968 $7,100

Coordination - Provided for preparation and administration of P.L. 88-309 projects.

Georgia 2-74,115-S — W.W. Anderson — Completed 1973 $109,300

Coordination - Provided for administration of P.L. 88-309 projects 1968-73.

Louisiana 2-20,130-S — William S. Perret — $29,000

Coordination - Provides for administration of P.L. 88-309 projects 1966-74.

Maine 3-70,123,183-S — Richard P. Choate — $49,500

Coordination - Provides for administration of P.L. 88-309 projects 1967-75.

Maryland 3-65-S — George J. Murphy — Completed 1970 $56,000

Coordination - Provided for administration of P.L. 88-309 projects 1967-70.

Maryland AFC-6 — George J. Murphy — Completed 1971 $13,000

Coordination - Provided for administration of P.L. 89-304 projects 1971.

Massachusetts 3-40,134-S — William A. Fitzpatrick — $46,000

Coordination - Provides for administration of P.L. 88-309 projects.

New York 3-84,160-S — Samuel L. Finkelstein — $30,500

Coordination of research and development - Provides for administration of P.L. 88-309 projects 1968-75.

Oregon 1-8,68-S — Robert E. Loeffel — Completed 1971 $42,434

Coordination - Provided for administration of P.L. 88-309 projects 1966-71.

Oregon AFC-12,48 — Kelly R. Conover — Completed 1971 $23,000

Coordination of Public Law 89-304 - Provided for administration of P.L. 89-304 projects 1968-71.

Puerto Rico 2-37,127-S — Rolf Juhl — $45,000

Coordination and administration - Provides for administration of P.L. 88-309 projects 1966-73.

Washington 1-17-S — Marshall Thayer — Completed 1968 $24,000

Coordination - Provided for administration of P.L. 88-309 projects 1966-68.

Washington AFC-4 — Marshall Thayer — Completed 1969 $22,000

Coordination - Provided for administration of P.L. 89-304 projects 1967-69.

DISEASE AND PARASITE CONTROL

Twenty-one projects for study of diseases and parasites in finfish and shellfish, with emphasis on development of disease-resistant oyster and control of parasites and diseases in Great Lakes fish, have been initiated. Of these projects initiated, 16 have been completed at a total cost of $1,430,360, and 5 at an estimated total cost of $610,578 are at various stages of completion.

Delaware 3-49-R — Don Maurer — Completed 1970 $127,800

Pilot studies of the spawning and rearing of MSX-resistant oysters - Research was continued to spawn and rear disease-resistant oysters for large-scale plantings. Five stocks presumed MSX-"resistant" and six stocks MSX-"susceptible" were used in the laboratory experiments.

Maryland 3-20-R — Victor Sprague — Completed 1968 $19,500

Development of a disease resistant oyster brood stock - Various strains of oysters were tested for a relative resistance to diseases. Laboratory and field studies have been made to develop a resistant brood stock. The stocks were tested in pond culture experiments.

Maryland 3-75-R — Fred Sieling, Jr. — Completed 1971 $97,500

Development of disease-resistant oysters (C. virginica) under field conditions in lower Chesapeake Bay - The level of MSX incidence in oysters on natural bars in the Manokin River was studied. Spat from disease-resistant brood stocks were used to repopulate areas where heavy mortalities occur.

Maryland 3-131-R — Fred Sieling, Jr. — $40,476

Molluscan mortality studies - To determine prevalence and infection intensities of parasites and diseases affecting the oyster resources and other molluscan species in Chesapeake Bay and tributaries.

Michigan AFC-7 L.N. Allison Completed 1970
$213,187

Parasites, diseases, and disease control of Great Lakes anadromous and commercial fish - This project was a part of a large research program on fish parasites and fish diseases at Michigan's State Fish Pathology Laboratory at Grayling. It was a study of red worm of yellow perch and of bacteria associated with seasonal mortality of the alewife.

Michigan AFC-9 L.N. Allison $70,000

Parasites and diseases of anadromous and commercial fish - This project is undertaken at the State's Fish Pathology Laboratory at Grayling to develop and evaluate diagnostic and clinical techniques to be applied by fish managers with emphasis on hatchery problems.

Mississippi 2-28-R David Cook Completed 1969
$111,500

A study of coliform bacteria and Escherichia coli on polluted and unpolluted oyster bottoms of Mississippi and a study of depuration by rebedding - Bacteriological analyses were made routinely of selected areas in Mississippi Sound to determine their sanitary quality. As suitable locations were found, oysters from polluted areas were moved into the area to define the length of time required for depuration.

Mississippi 2-85-R David Cook Completed 1972
$114,845

A study of the parasites and diseases of fish, mollusks, and crustacea utilized in mariculture - This study was made by the Gulf Coast Research Laboratory to identify the parasites and diseases of marine species that are of potential value in mariculture, to determine the conditions under which these parasites and diseases exist, and to seek effective methods of control of the parasites and diseases of marine species under conditions of mariculture.

Mississippi 2-174-R Robin M. Overstreet $36,456

Parasites, diseases, and control of diseases of commercially important finfish and shellfish - This study is conducted from the Gulf Coast Research Laboratory to assess the parasites and diseases from selected hosts, such as Florida pompano, Atlantic croaker, striped mullet, blue crab, and shrimp that could affect the corresponding commercial fishery. Methods to control some of the diseases present in rearing facilities will be investigated.

Missouri 4-66-R Robert C. Summerfelt Completed 1971
$4,313

Transmission of an ovary parasite of the golden shiner - This work was carried out at the Ozark Fisheries, Stoutland, to make the following determinations concerning the transmission of protozoan in golden shiner: if transmission per se is feasible; if transmission results from spore attachment to the egg membrane; if hereditary (intraovum) transmission is possible.

Missouri 2-131-D Gary Camenisch Completed 1971
$5,403

Equipping fish disease laboratory - Equipment was provided for a fish disease diagnostic laboratory so that it will be possible to control or eradicate such problems in State and commercial hatcheries.

New Jersey 3-3-R Harold Haskin Completed 1972
$150,000

Disease-resistant oyster program - Delaware Bay - This project was a continuing study to provide basic knowledge for consistent production of a disease-resistant stock of oyster seed and to increase the yield of marketable oysters from such seed through control of various causes of mortality. These objectives were approached by experimental testing of disease resistance in the field, experimental approach to control predators, use of lower Delaware Bay spat as seed oysters, and artificial rearing of disease-resistant strains of oysters at the Cape Shore Laboratory.

Ohio 4-47-R Wilbur M. Tidd Completed 1970
$16,000

The status of whirling disease in Ohio waters - The extent to which whirling disease exists in Ohio salmonids in private and public waters, presence of spores, and by what methods the disease is transmitted were investigated.

Ohio 4-68-R | Wilbur M. Tidd | $20,000

Detection of Myxosoma cerebralis spores in trout holding facilities - The purpose of this study is to develop an accurate method for detecting spores of Myxosoma cerebralis in holding facilities of rainbow trout and to determine concentrations necessary to transmit the disease. Effects of water temperature and water chemistry on spore development will be investigated also.

Tennessee 4-72-R | W.A. Rogers | Completed 1971 $9,970

Investigations of parasites and diseases of cultured fish - This project provided for laboratory experiments under different water qualities such as hardness, temperature, pH, and turbidity, to test the efficacy of various chemicals that are effective pathogen controls. The work was done at Auburn University, Auburn, Alabama.

Tennessee 2-151-R | W.A. Rogers | Completed 1972 $6,667

Studies on channel catfish virus disease - The purpose of this study was to determine if channel catfish brood stock are carriers of viable virus and, if so, whether or not the virus is shed in excretory products or passes to the offspring via sex products.

Tennessee 2-194-R | W.A. Rogers | $10,667

Parasites and diseases of cultured catfish - The objective of this study is to provide diagnostic service to commercial catfish producers by identification of disease-producing organisms. Laboratory research will be done on the organisms to determine pathogenic qualities and to test efficacy of various chemicals.

Virginia 3-6-R | Jay Andrews | Completed 1970 $184,325

Production of disease-resistant oysters - Efforts to breed oysters and speed development of populations resistant to MSX still offer the best hope of returning infested areas to useful production. This goal is being accomplished by testing stocks of oysters for disease resistance, breeding potentially disease-resistant oysters, determining disease agents, and continuing the selection and concentration of potentially disease-resistant stocks. The research was along these lines in waters adjacent to the Virginia Institute of Marine Science, Gloucester Point.

Virginia 3-62-D | Charles Bagnell | Completed 1969 $290,000

Propagation of disease-resistant oysters - The purpose of this project was to provide cultch on which spat could set in areas where MSX is known to be present. Work was in the waters of the Piankatank and Rappahannock Rivers and Mobjack Bay. About 1,002,714 bushels of cultch material were planted. The brood stock was not affected by the MSX disease; the researchers expect that the resultant larvae will also be disease resistant.

Virginia 3-127-R | Jay A. Andrews | Completed 1971 $23,750

Testing of disease-resistant oysters - Selecting and testing of resistant stocks by mass selection and progeny-testing techniques were investigated. Monitoring of seed areas for level of resistance to MSX and exploring the manipulation of seed and brood stocks to avoid losses of MSX and other mortality agents were investigated also.

Washington 1-43-R | Ronald Westley | Completed 1971 $55,600

Oyster drill (Ocinebra japonica) control - The behavior patterns of Japanese oyster drills and egg cases, and control measures were the main purpose of this study at the Point Whitney Shellfish Laboratory, Brinnon. Investigations in the laboratory and in the field indicate that the male drills are attracted to a water-borne substance released by the female. Further work defined this substance. The testing of chemicals to control the drill is continuing.

Seven projects with emphasis on economic aspects of the commercial fisheries and baitfish industries have been completed. The total project cost was $122,000.

Georgia 2-46-R — D.J. Purcell — Completed 1968 — $25,000

Economic survey of the marine commercial fishing industry of Georgia - A survey of the economic importance of the seafood industry from the fishermen to the consumer has been completed. It also included the effect of physical and socio-economic factors on the consumption of seafoods and the future demands.

Maryland 3-42-D — Richard E. Suttor — Completed 1969 — $41,100

An economic study of the fisheries and seafood-processing industries with emphasis on the Chesapeake Bay - This study provided an analysis on the demand for seafood by region of the United States, the supply of seafood from the Chesapeake Bay fisheries, and factors affecting the size and location of the seafood-processing industries in the Chesapeake Bay area. The work was conducted at the University of Maryland, College Park.

Montana 1-45-R — Glenn R. Barth — Completed 1969 — $20,400

An economic study of marketing Montana commercial fisheries products - Markets for selected classes of goldeye, carp, and buffalofish were identified and evaluated.

North Dakota 4-20-D — David C. Nelson — Completed 1968 — $10,000

Commercial fish markets for North Dakota fisheries - The market demand, alternate uses, and potential demand for North Dakota fisheries have been identified. The State estimates that about 14 million pounds of fish are available to commercial markets.

Ohio 4-64-D — John M. Pierce — Completed 1971 — $15,750

Ohio's live bait industry: its extent, condition, and problems - Under this project an evaluation was made of the economic importance of the live bait industry to Ohio's economy. Also, problems of the industry were investigated to assist in the development and growth of the industry.

Wisconsin 4-41-D — Sydney D. Staniforth — Completed 1968 — $6,000

A study of the contribution of bait dealers and private fish hatchery operators to the commercial fish industry of Wisconsin - Information was obtained on the bait dealers and private fish hatchery industry, including species of fish used, value, volume, capital, investment, and other related data. This information will be tabulated and reports prepared to assist in the development of long-range planning and operation of resource agencies.

Wisconsin 4-62-D — W.B. Lord — Completed 1970 — $3,750

Economic aspects of Lake Superior trout fishery - Economic information was obtained to assist in the establishment of regulatory, predator control, and stocking policies for lake trout in Wisconsin's waters of Lake Superior.

EXPLORATORY FISHING AND GEAR DEVELOPMENT

Twenty-two projects have been funded to evaluate currently used fishing gears, develop new gears, and locate new fishery resources. Of the projects funded, 21 have been completed at a total cost of more than $2 million, and 1 is continuing at an estimated total cost of about $100,000.

American Samoa H-8-D — James R. Holloway, Sr. — Completed 1969 — $222,537

Determination of the feasibility of developing offshore commercial fishing in American Samoa - This project evaluated the techniques, vessels, and fishing gear most suitable for developing offshore commercial fishing, conducted exploratory fishing for marine animals of potential commercial value, and investigated the economic potential for the fishery products in the island and elsewhere.

American Samoa H-15-D — James R. Holloway, Sr. — Completed 1972 — $242,250

Development of a pole and line skipjack tuna fishery in American Samoa - Objectives of this project were to determine the distribution and abundance of bait fish in Samoa waters.

Georgia 2-68-R — Walter F. Godwin — Completed 1970 — $82,680

Exploratory study of the commercial marine resources of the Georgia coast - Exploratory cruises were conducted on a seasonal basis to evaluate the commercial potential of pelagic and demersal food fish, calico scallops, and hard clams inside 10 fathoms off the Georgia coast.

Guam H-7-D — Isaac I. Ikehara — Completed 1969 — $145,585

A study to determine the feasibility of developing a deep-sea commercial fishing industry on Guam - This study investigated the feasibility of adopting the Hawaiian-type sampans for fishing offshore around Guam, determined the relative potential importance of the various fish groups, and tested the marketability of the various species of fish that can be produced in commercial quantities from offshore waters.

Massachusetts 3-73-R — R. Barry Fisher — Completed 1968 — $45,000

Study of the feasibility and application of Danish seining to the Massachusetts fishing industry - Comparative fishing trials have been completed using a Danish seine and an otter trawl in the coastal waters of Massachusetts. Results of this study are inconclusive as to the application of this new gear to the industry.

Minnesota 4-22-D — Charles R. Burrows — Completed 1969 — $15,300

Development of under-ice horizontal sonar scanning equipment and techniques for locating fish schools - The development of gear and methods for locating schools of fish under the ice with sonar scanning equipment has been completed.

New Hampshire 3-105-R — William C. Ayer — Completed 1971 — $40,650

A comparative study of conventional and experimental inshore lobster gear - The main objective of this project was to analyze the efficiency and economy of commercial experimental and conventional inshore lobster gear in order to determine the best type of gear for harvesting the resources.

North Carolina AFC-5 | Frank Holland | Completed 1971 $235,796

Offshore anadromous fish exploratory fishing program - Exploratory fishing was conducted along the Outer Banks to determine the distribution and relative abundance of American shad, striped bass, and other anadromous fish.

Oklahoma 2-154-R | Bob Grinstead | $42,400

Oklahoma commercial fishing industry management program - This project is undertaken to obtain information on commercial fish, mussel, bait fish, and fish farming throughout the State with emphasis on the Keystone and Texoma Reservoirs, to more effectively manage and regulate these resources.

Puerto Rico 2-39-R | Rolf Juhl | Completed 1969 $136,130

Gear research and testing of improved commercial fishing boats - The suitability of commercial fishing gear and boats needed for upgrading the fisheries of Puerto Rico was investigated. A Florida-type 37-foot lobster boat powered with a 160 hp. diesel was outfitted and fished. Pots and longlines were used to make the investigation.

Puerto Rico 2-70-R | Rolf Juhl | Completed 1970 $206,720

Exploratory and test fishing for tuna - Limitations imposed by tuna conservation measures and foreign restrictions on traditional fishing grounds have created a need for developing other fishing areas. Exploratory cruises were made to determine if the Central Atlantic and Caribbean areas have enough tuna to support a purse seine fishery. The National Marine Fisheries Service provided a predetermined cruise track to give maximum coverage of the area.

Puerto Rico 2-89-R | Rolf Juhl | Completed 1972 $370,000

Gear research, exploratory fishing, and demonstrations - Improved boats, equipment, and gear were introduced to upgrade the Puerto Rico fisheries. Also, new fishing areas were located and improved fishing techniques and equipment were demonstrated.

Rhode Island 3-53-R | Richard W. Burton | Completed 1967 $20,000

Operational testing of two pelagic trawls on two small draggers - This study off Point Judith has been completed, and recommendations have been made to the New England fishing industry relative to the nets, doors, and transducer system.

Rhode Island 3-90-R | David R. Thomson | Completed 1969 $12,900

Assessment of the efficiency of the Danish Vinge trawl over conventional New England drag nets - Fishing trials have been completed with the Danish Vinge trawl in Rhode Island waters. The trawl was modified to fish off bottom primarily for sea herring and alewife. Daily catches average 40,000 pounds per vessel and exceeded the catches of the conventional New England bottom trawl. Vessel owners were impressed over the catches with the Vinge trawls and have ordered several trawls. Results of this study have been made available to the New England fishing industry.

South Dakota 4-37-D | Donald Warnick | Completed 1971 $13,535

Commercial fishing gear research and development for lakes and reservoirs in South Dakota - The catch data from floating trap nets constructed in 1968 were compared with catches from gill nets and frame nets normally used by commercial fishermen. These data were evaluated to determine the most efficient methods of harvesting buffalofish, carp, and sucker.

South Dakota 1-74-D — Completed 1973 — $12,160

Application of sonar fish detector techniques to increase annual production - The purpose of this study was to familiarize commercial fish contractors with recently developed under-ice fish detection techniques in an effort to increase their harvest.

Tennessee 4-5-R — Harry L. Hargis — Completed 1968 — $35,670

Development of improved fishing methods for use in southeastern and southcentral reservoirs - Haul seines and trap nets were tested to determine their effectiveness in harvesting commercial fish species such as carp, buffalofish, and sucker.

Virgin Islands 2-33-R — Arthur E. Dammann — Completed 1969 — $104,340

Study of the fisheries potential of the Virgin Islands - Very little basic ecology and oceanography have been done on the fisheries in the Virgin Islands. The commercial fishery is still carried on by a high percentage of "pot" fishermen, and the quality of the product they supply the consumer is nearly always substandard. Under this project, methods of harvesting and handling that have practical value in improving the fishery were investigated. Also, the extent to which long-range fishing is feasible was considered.

Virgin Islands 2-96-R — Arthur E. Dammann — Completed 1970 — $23,720

Exploratory fishing for a source of nonciguatoxic sport and food fish - The purpose of this project was to fish deep water at the edge of the 100-fathom curve in an attempt to locate fishing grounds which are free of ciguatoxic sport and food fish and to establish a bio-assay for testing large numbers of individual fish for the presence of ciguatoxin.

Virgin Islands 2-121-R — Arthur E. Dammann — Completed 1971 — $28,310

Research and development of deep-water commercial and sport fisheries around the Virgin Islands plateau - Exploitable resources of bottom fishes around the 100-fathom curve were defined through exploratory fishing with reels, bottom lines, and traps. Also, commercial and sport fishermen were assisted in location of these resources and informed about methods of harvesting the fish.

Virginia 3-124-R — Dexter S. Haven — Completed 1973 — $195,554

An investigation into commercial aspect of the hard clam fishery and development of commercial gear for harvest of molluscs - This project was undertaken to develop a medium-size tow hydraulic dredge to harvest clams.

Washington 1-39-D — Allan E. Millikan — Completed 1970 — $35,750

Mid-water trawl fisheries management investigation - A new commercial fishery for Pacific hake began along the Washington coast during the fall of 1965. This project provided for the collection of statistical data on the fishery off the Washington coast, and continued experimental and exploratory fishing with mid-water trawl for harvesting hake and other species in commercial quantities in Puget Sound.

Eighteen projects have been funded to assist the commercial fishing industry to reduce operation costs and increase efficiency in producing, harvesting, processing, storing, and transporting of fish and fish products. Of the projects funded, 9 have been completed at a total cost (both State and Federal) of $696,853, and 9 are continuing at various stages of completion at a total estimated cost of $847,390.

Alabama 2-58-D	Johnie Crance	
Florida 2-50-D	Harmon Shields	
Louisiana 2-57-D	Theodore Ford	
Mississippi 2-59-D	William Demoran	Completed 1969
Texas 2-48-D	Terrance Leary	$39,500

Gulf of Mexico estuarine film - The five Gulf States and the National Marine Fisheries Service cooperated in the preparation and distribution of 28-minute and 12-minute, color, sound motion picture films showing the values and problems facing our Nation's estuaries.

Alabama 2-141-R	Wayne E. Swingle	$11,000

Publication and reproduction of research reports - Provides for publication of findings from Federal aid and other research projects, purchase of reprints, and distribution of these publications and reprints.

Florida 2-126-D	Charles B. Davies	Completed 1971 $34,870

Fisheries technical assistance - This project was undertaken to train seafood quality control personnel in sanitation and quality retention and to provide advisory assistance to industry.

Florida 2-152-D	Frances Felsburg	Completed 1972 $147,577

Fisheries extension service - Efforts were made to restore consumer confidence in fisheries products through accepted extension service and demonstration techniques.

Florida 2-177-D	C.B. Davies	$4,000

National molluscan film - Purpose of this project is to purchase 10 copies of the national molluscan film developed by a multi-State cooperative effort under P.L. 88-309.

Guam H-12-D	Isaac I. Ikehara	Completed 1972 $120,000

Development of Guam's commercial fisheries potentials - The purpose of this study was to develop methods to increase commercial fish catch efficiency by training fishermen in the use of more efficient techniques and to locate species of fish of commercial importance.

Maine 3-13-D	Paul M.W. Venno	Completed 1973 $176,000

Maine marine fisheries extension service - This project was undertaken to disseminate information about the various commercial fisheries to the fishing industry along the coast of Maine and to potential members of the industry.

Maine 3-177-D	Afton H. Farrin, Jr.	$31,000

Marine resources extension services - The objective of this project is to revitalize the fishing industry of Maine by (1) increasing the use of applied research, (2) developing underutilized fish resources, (3) disseminating research information to the fishing industry, and (4) promoting improved facilities for use by the fishing industry.

Maryland 3-71-D	William Sieling	Completed 1970 $57,800

Maryland marine fisheries extension service - The purpose of this project was to disseminate to the fishing industry of tidewater Maryland and the elected legislative officials of the State current information relating to (1) applicable results of scientific investigations, (2) technological developments, (3) marketing opportunities, and (4) managerial policies and the reasons for their adoption.

Maryland 3-126-D — William Sieling — $34,000

Seafood extension service - Results of scientific investigations, technological developments, and marketing opportunities are disseminated to persons who harvest and process fishery resources.

Florida 2-177-D	C.B. Davies	
Maryland 3-144-D	George Murphy	
New Hampshire 3-146-D	Bernard Corson	
New Jersey 3-145-D	Russ Cookingham	
New York 3-154-D	Samuel L. Finkelstein	
Pennsylvania 3-147-D	Howard L. Miller	
Texas 2-135-D	William B. Schwartz	
Vermont 3-148-D	Edward F. Kehoe	Completed 1972
Virginia 3-141-D	Milton T. Hickman	$72,000

National molluscan film - This project was a multi-State cooperative effort for development of the shellfish industry through the purchase and distribution of a national molluscan film.

Massachusetts 3-60-D — H. Arnold Carr — Completed 1972 $86,820

Shellfish technical assistance - Technical assistance and advice were provided to town and regional shellfish management programs. Management practices such as raft culture of oysters, collection and redistribution of spat, reseeding operations, predator control, and other activities designed to increase harvests were encouraged.

Massachusetts 3-109-D — Charles E. Martin — $70,000

Massachusetts commercial fisheries extension service - Objectives of this project are to establish and conduct a commercial fisheries extension service providing on-site technical advisory services, dissemination of information, and an avenue of communication between the fishing industry and research groups, designed to improve the economic posture of the Commonwealth's fishing community.

Massachusetts 3-178-D — John M. Hickey — $14,000

Shellfish technical assistance - The objective of this work is to provide technical assistance to the shellfish fishing industry in modern ways of culturing and harvesting important shellfish along the Massachusetts coast.

Puerto Rico 2-71-D — Rolf Juhl — Completed 1969 $5,786

Training of fishermen for the tuna industry - A cadre of fishermen for high-seas and distant water fishing operations was trained. Arrangements were made with the Puerto Rican based purse seine fleet operators to employ trainees for a period of 6 months.

Puerto Rico 2-183-R — Rolf Juhl — $92,000

Commercial fishing survey and development - This project is undertaken to upgrade the commercial fishing industry through the expansion of fishing areas and introduction of improved fishing vessels, equipment, and fishing methods.

Tennessee 2-176-R — Peter Krenkel — $24,060

Standardization of methyl mercury analysis - This study is undertaken to obtain or produce a procedure for analysis of methyl mercury and derivates so a reasonably well-trained technician can make an analysis on both fish tissue and sediments.

Virgin Islands 2-193-R — Joseph R. Sylvester — $24,330

Modernization of small Virgin Island fishing boats and equipment - The purpose of this project is to demonstrate and apply modern fishing gear to fishermen to improve and update local fisheries. In addition, the small demonstration boats will be equipped with necessary gear.

Thirty-four projects have been funded in 11 States and Puerto Rico to obtain information that would assist the fishing industry in harvesting, handling, and processing raw fish harvested. Of the projects funded, 30 have been completed at a total cost of $1,330,027, and 4 are continuing at various stages of completion at an estimated total cost of $316,100.

Maine 3-17-R — Robert L. Dow — Completed 1967 $95,000

Study of the economic and operational feasibility of mechanization of the Maine sardine processing and canning operations - This project developed more efficient and lower cost methods of processing and canning Maine sardines.

Maine 3-18-R — Robert L. Dow — Completed 1966 $7,247

Investigation of physical aspects of raw herring - Raw herring, when taken from the nets and landed at the dock, were examined to determine the quality of the resultant canned product as sardines. Factors considered were length and weight of fish used in the investigation, food habits, thickness of belly wall, fat content, and quality of canned product.

Maine 3-94-D — Richard E. Reed — Completed 1969 $8,000

Testing and adapting existing sardine processing equipment - This project was designed to test processing equipment. Demonstrations were made to aid in the training of employees of canners interested in such equipment.

Maryland 3-81-D — Mahlan C. Tatro — Completed 1969 $41,900

Pasteurization of crabmeat through the use of radio frequency waves - This project was undertaken at the University of Maryland to develop technical controls needed in the commercial operation of rapid pasteurization of crabmeat and other seafoods.

Maryland 3-86-D — Fred W. Wheaton — Completed 1970 $61,000

Oyster shucking study - In view of the need for automation in the oyster industry, this study investigated the application of engineering principles to this industry. The Agricultural Engineering Department of the University of Maryland studied ways to improve oyster shucking methods and equipment, and also improve the productivity of labor.

Maryland 3-129-D — Fred W. Wheaton — Completed 1971 $40,726

Oyster processing study - This study was to refine the engineering analysis of oyster processing, handling, and harvesting and to conduct theoretical and laboratory investigations of techniques to enhance labor productivity in harvesting, handling, processing, and transporting systems. New techniques and related equipment modules that improve overall aspects of oyster production were investigated also.

Maryland 3-152-D — Fred W. Wheaton — $50,000

Engineering principles as applied to oyster processing problems - This project continues the State's efforts on analysis of harvesting, handling, and processing oysters, with emphasis on solving problems created by hand labor. The work is centered at University of Maryland, College Park.

Massachusetts 3-35-R — Robert E. Levin — Completed 1970 $155,913

Marine food science and technology research on sanitation and handling for purpose of improving product quality and shelf-life of Massachusetts commercial fishery products - The Department of Food Science and Technology of the University of Massachusetts surveyed the bacteriological and sanitary aspects of handling facilities and practices that affect the quality of fish offshore and inshore. The purpose was to establish criteria for the proper handling of seafood products from the producer to the consumer. Technical information was disseminated through leaflets and newsletter.

Mississippi 2-61-R — David W. Cook — Completed 1970 — $56,870

A study of bacterial spoilage patterns in iced Penaeus shrimp - The primary objective of this project was to study the pattern of growth of various bacteria that contribute to the spoilage of Penaeus shrimp stored in crushed ice. Comparisons were made of the development of bacteria in aseptically handled and commercially handled shrimp. Bacteriological changes were compared with the organoleptic quality of the shrimp and the production of trimethylamine in the shrimp. Gulf Coast Research Laboratory, Ocean Springs, did this work.

Missouri 4-34-D — Ruth E. Baldwin — Completed 1969 — $15,200

Palatability of Missouri fish - A trained panel tested cubed, cooked fish fillets to determine the acceptability of different species of fish.

North Carolina 2-8-R — Neil B. Webb — Completed 1968 — $37,100

A study of the quality of North Carolina scallops - As a result of scientific studies, the industry has been given recommendations for handling scallops from the time they are harvested through the various handling and processing stages to the final packaging. Following these recommendations will ensure a top-quality product.

North Carolina 2-76-R — Neil B. Webb — Completed 1969 — $16,700

Studies on the effects of processing on the quality of seafood products - This study, undertaken at North Carolina State University, was designed to determine how mechanical processing affects the quality of seafood products. Experiments were made to discover the optimum temperatures for opening the shell by heat shock, for separating the meat and viscera, and for final rinsing and storage of the meats. An evaluation of the finished product quality in relation to standards established for hand-shucked and processed scallop meats was also made.

North Carolina 2-100-R — Neil B. Webb — Completed 1972 — $50,000

The investigation of methods for improving and evaluating the quality of seafood products - The objective of this project was to develop methods of utilizing byproducts, as well as the sea products themselves, from the processing industry through temperature control systems, development of improved sanitation, and quality control.

North Carolina 2-197-R — George Giddings — $16,700

Effects of post-harvest handling, processing, and storage on quality and properties of seafoods - This project will study the effects of post handling, processing, and storage on selected marine fish tissue proteins and investigate means of control of microbial contamination in seafood processing plants. Work will be done in the Department of Food Science of North Carolina State University, Raleigh.

Ohio 4-26-R — Howard S. Teague — Completed 1969 — $85,500

Value of whole fish meal in breeding-gestation rations for swine - This project was carried out at the Robison Swine Research Center, Ohio Agricultural Research and Development Center, Wooster. Whole fish meal was fed to sexually mature Duroc gilts to determine the level and length of feeding period required to obtain measurable effects on the reproductive function of swine. Both the fish meal and complete ration were analyzed for protein, fat, fiber, nitrogen-free extract, amino acid, trace minerals, and vitamin content.

Ohio 4-65-R — Howard S. Teague — Completed 1971 — $50,000

Effect of whole fish meal on reproductive performance of swine - The objectives of this project were to determine the effect of two different dietary levels of whole fish meal on the reproductive efficiency of swine as assessed by number, weight, and vigor of baby pigs born, and livability and weight gains of the baby pigs to weaning age. Additionally, the effect of the dietary treatments on certain blood constituents which may have an effect on the animals' reproductive ability was investigated.

Ohio 3-159-R H.S. Teague $29,000

Physiological effects of fish meal on swine reproduction - The objectives are to determine the effect of whole fish meal consumption on physiological functions related to reproduction in the gilt and sow and the levels required to influence reproductive functions.

Oregon 1-10-D David L. Crawford Completed 1970
$71,771

Development of the shad industry - Oregon State University Seafoods Laboratory at Astoria developed new products using American shad and ground fish. Shad and striped bass have been used to make an acceptable smoked pepperoni product. The shelf-life of this appetizing fish product was evaluated. A frozen brown-and-serve fish sausage with a fresh pork sausage seasoning has been formulated. Development of a fish loaf of the luncheon meat type was considered.

Oregon 1-12-R Duncan K. Law Completed 1970
$134,167

Utilization of hake, dogfish, and by-products of the fillet industry for protein supplements - The State of Oregon has a large quantity of hake and dogfish, both sources of animal protein, and, in addition, the bottomfish industry provides fillet scrap that amounts to over 60 percent of trawl fish landed. Oregon State University, Corvallis, and their seafood laboratory at Astoria experimented with these fish to develop stable protein products and to determine possible uses of such products. An 8-week broiler production feeding trial combining herring and hake to improve body weight and decrease food consumption was completed. Preparations to evaluate hake meals as a source of protein for trout were investigated.

Oregon 1-15-R J.E. Oldfield Completed 1968
$18,153

Processed hake in feed for mink - This study was made to determine if Pacific hake could serve as the source of protein in mink ration.

Oregon 1-25-R David L. Crawford Completed 1970
$16,000

Utilization of hake for human food - The purpose of this study was to investigate the use of hake as a high-quality food for human use, with emphasis on the autoxidation of the oil of hake and means of rancidity control in fresh, frozen products.

Oregon 1-34-R James E. Langler Completed 1970
$60,000

Preparation of marine protein concentrate from hake - Studies at Oregon State University Seafood Laboratory, Astoria, using drum drying to make fish protein concentrate indicate that oil will separate from hake during the drying process. Experiments were made to evaluate the use of antioxidants and their effect in preventing deterioration, oxidation, or extractability of lipids.

Oregon 1-58-D David L. Crawford Completed 1971
$12,000

Development of new human food products from shad - Conventional methods of processing and preparing fishery products, such as canning, salting, pickling, and smoking, that are compatible with shad flesh were investigated. The use of commercial shad flesh from a deboning machine was investigated also.

Oregon 1-59-D David L. Crawford Completed 1973
$50,000

Utilization of hake for human food - Hake for food for human use was investigated, with emphasis on the autoxidation of the oil and means of controlling rancidity and texture changes in fresh and frozen products.

Oregon 1-63-R — David L. Crawford — Completed 1973 — $44,250

Discoloration in fresh and frozen crab meat - Objectives were to improve methods and techniques in the handling and storage of dungeness crab and crab meat and in maintaining the natural color and quality of canned crab meat.

Oregon 1-64-R — David L. Crawford — Completed 1971 — $18,000

Preparation of fish protein concentrate - Methods and procedures for the preparation of low-fat fish protein concentrate from machine-deboned and skinned, round and eviscerated hake were investigated.

Oregon 1-67-D — David L. Crawford — Completed 1972 — $14,000

Utilization of dogfish for human food - The project was undertaken to examine the relative Hg levels in adult dogfish and test feasibility of reducing Hg levels in minced flesh by extraction.

Oregon 1-69-R — David L. Crawford — Completed 1973 — $44,000

Preparation of fish protein hydolysates - Development and improvement of methods for preparing protein hydrolysates from fish fillet scrap and waste fish including hake and dogfish were investigated.

Puerto Rico 2-104-R — W.D. Brown — Completed 1972 — $30,000

Investigation of green tuna meat - The main objectives were to conduct research which will lead to the development of techniques by which the "green" fish condition can be predetermined, the cause and prevention, if possible, of this condition, and its control and/or neutralization--specifically, research on "freeze-enhanced oxidation of tuna pigments."

Puerto Rico 2-159-R — Walter A. Mercer — $31,500

Survey of micro-constituents in canned seafood and development of protective procedures - This project is subcontracted to Tuna Research Foundation to survey the occurrence of mercury in various species of tuna, to design adequate sampling procedures for raw fish with respect to mercury and other micro-constituents, and to attempt a reduction of the mercury content of tuna fish prior to canning.

South Dakota 4-21-D — Kenneth Schneider — Completed 1968 — $37,667

Missouri reservoir fisheries product development and evaluation - Research was performed to determine the chemical and physical factors that affect the use of carp for food.

Tennessee 4-31-D — M.R. Johnston — Completed 1968 — $4,890

Evaluation of whole fish meal as a protein supplement for swine - The University of Tennessee Agricultural Experiment Station, Knoxville, has done research on the value of whole fish meal as a protein supplement to swine at 40 pounds live weight and carried to an average pen weight of 200 pounds.

Tennessee 4-40-D — Grayce E. Goertz — Completed 1970 — $17,993

Formula development and acceptability evaluation of selected seafood entrees - The purpose of this project was to test the nutritional value of canned and frozen seafood products. The Department of Food Science and Institute Management, University of Tennessee, evaluated the acceptability of the seafood in Knoxville elementary schools and other areas of the State.

Washington 1-41-R — Lawrence R. Berg — Completed 1969 — $36,000

Determination of the nutritive value of North Pacific fish meals for poultry - Fish meals were recognized as excellent sources of protein, amino acids, vitamins, minerals, and energy for inclusion in rations of various types of poultry. This study was undertaken to evaluate meals from North Pacific fish, such as anchovy, dogfish, and hake, which will be used in the formulation of feeds for chickens, turkeys, and other egg-laying birds. Also, the relative nutritive worth of such fish meals such as herring meal was considered.

MARKET DEVELOPMENT

Fifteen projects have been funded in seven States to effect greater use of seafoods and fishery byproducts. Of the projects funded, 9 have been completed at a total cost (both State and Federal) of $3,090,318 and 6 are continuing at various stages of completion at total estimated cost of $1,454,370.

Florida 2-11-D — H.W. Shields — Completed 1970 — $1,345,780

Marketing of seafoods - This project promoted greater consumption of Florida seafood throughout the Southeast and other areas of the country through distribution and development of visual education materials, new products, and new recipes. The main seafood resources in need of new markets are shrimp, crab, mullet, and Spanish mackerel.

Florida 2-125-D — C.C. Shuman, Jr. — Completed 1971 — $213,100

Fisheries marketing and extension service - The purpose of this project was to effect a free flow of commercial fisheries products in national trade channels in coordination and cooperation with industry, trade associations, and others.

Florida 2-191-D — Frances Felsburg — $141,577

Fisheries extension and marketing services - Project objectives are to initiate extension program designed to teach professional foods people the techniques of fish cookery; proper handling, storing, and preparing fish; and ways to maintain and expand consumer demand for fishery products.

Illinois 4-35-D — Maxine Walzer — Completed 1970 — $21,200

Consumer education and market development - The general aims of this project were to develop and disseminate materials showing nutritional and economic advantages of feeding fishery products in State institutions, hospitals, and volume-feeding establishments; and to provide consumer education for the purpose of increasing consumption and demand for domestically produced fishery products.

Maine 3-24-D — George H. Taylor — Completed 1970 — $194,028

Promotion and market development - Public knowledge and awareness of a variety of Maine seafoods, particularly sardines, shrimp, and softshell clams, were promoted through educational films, food shows, and related exhibitions, and by distribution of educational materials to chain stores, supermarkets, and other retail outlets.

Maine 3-115-D — George H. Taylor — $42,000

Market development - The objectives of this project are to improve market conditions and to increase the sale of Maine seafood products. This program will be developed in close cooperation with producers, processors, wholesalers, retailers, and consumers. Since neither the fishermen nor any of the various middlemen could exist without the consumer, primary emphasis will be placed on the development and use of consumer education techniques.

Maine 3-176-D — George H. Taylor — $50,000

Market development - This project is to expand existing markets and to develop new markets for Maine seafood products through three major activities: (1) audiovisual; (2) marketing data and products development; and (3) information and education.

Maryland 3-66-D — Gordon P. Hallock — Completed 1971 — $493,800

Market development for Chesapeake Bay seafoods - Under this project, Maryland worked closely with the seafood industry and users to effect greater use of Chesapeake Bay seafoods by volume-feeding establishments and the general consumer. Educational materials such as video tapes, films, and recipe booklets suitable for restaurant and retail store seafood promotions were developed.

Maryland 3-132-D — Gordon P. Hallock — $89,340

Maryland seafood marketing - The objective of this project is to develop marketing opportunities for Chesapeake Bay seafood industry oysters, crabs, clams, rockfish, shad, herring, sea squab, and eels.

Massachusetts 3-50-D — Frank Grice — Completed 1970 — $480,000

Consumer education and market development - The overall objective of this project was to promote greater national use of northwest Atlantic seafoods and thus improve the economy of the New England fishing industry. A major effort was made through a program of consumer education that was patterned after the highly successful promotion of sea scallops landed in New Bedford.

Massachusetts 3-136-D — Hugh F. O'Rourke — $91,700

Massachusetts fisheries marketing program - The objectives of this project are to educate and inform volume-feeding operators about Massachusetts fish and shellfish and correct serious supply and demand imbalances.

Texas 2-62-D — Terrance Leary — Completed 1970 — $166,410

Seafood marketing - To promote greater sale of Gulf seafoods, Texas undertook a combined consumer educational, market development, and market promotional program in cooperation with industry, Federal agencies, and other State agencies. This program was accomplished mainly through the development and distribution of educational materials such as video tapes, films, recipe leaflets, cookery demonstration, and exhibits.

Virginia 3-69-D — Jack L. Wright — Completed 1970 — $96,000

Consumer education and market development - Through the use of newspapers, radio, and TV media, promotional materials, and public relations, the Virginia Commission of Fisheries promoted greater use of Central Atlantic seafoods on a national and area basis, and thereby improved the economic position of the seafood industry.

Virginia 3-125-D — Jack L. Wright — Completed 1972 — $80,000

Virginia seafood marketing - The objective of this project was to increase utilization of products of the sea, with emphasis on blue crabs, oysters, and clams.

Virginia 3-164-D — Virginia Seafood Council Staff — $40,000

Virginia seafood marketing - The purpose of this project is to assist the Virginia fishing industry in improving the quality and production of fishery products and to increase the institutional use of seafood.

OPERATION AND MAINTENANCE

Eleven projects have been funded for operation and maintenance of laboratories and fish production facilities constructed under the program. Of the projects funded, 9 have been completed at a total cost (both State and Federal) of $1,150,355 and 2 are continuing at a total estimated cost of $1,038,800.

California AFSC-15 — Robert D. Will — $288,800

Mad River fish hatchery operations - Provides for operation and maintenance of the Mad River fish hatchery to augment north coastal fisheries for steelhead and salmon by rearing and releasing annually one million yearling steelhead and silver salmon in comination and 5 million king salmon. This hatchery, located in Humboldt County, was constructed under the program.

New York 3-95-D — Albert C. Jensen — Completed 1972 $107,000

Operation and maintenance of marine laboratory - This project provided operational funds for the newly constructed marine laboratory at Flax Pond. The laboratory, built under project 3-10-C, includes wet and dry laboratories along with salt- and freshwater systems and related equipment.

New York 3-161-D — Albert C. Jensen — $52,800

Operation and maintenance of marine laboratory, Flax Pond, Old Field - This project is a continuation of project 3-95-D for operation and maintenance of the laboratory for 3 years at an annual cost of about $48,000.

Oregon AFC-22 — Austin Magill — Completed 1968 $66,805

Production and distribution of anadromous salmonids from the Alsea River salmon hatchery - Unfed fingerlings and excess adult salmon from the Alsea River hatchery in Lincoln County were released to populate areas made available by the State's stream clearance program and other areas having rearing potential.

Oregon AFC-30 — Austin Magill — Completed 1970 $109,500

Hatch, rear, and release salmonids at the North Nehalem River salmon hatchery - This project supported operation costs of six rearing ponds at the North Nehalem salmon hatchery. The North Nehalem River hatchery is located about 70 miles west of Portland in Clatsop County and is operated for production of coho and fall chinook salmon and for the distribution of the fingerlings into the North Nehalem River and adjacent waters.

Oregon AFC-36 — Austin Magill — Completed 1970 $91,750

Hatch, rear, and release salmonids at Elk River salmon hatchery - Adult salmon were spawned, their eggs fertilized and hatched, and the resulting juveniles ponded and reared for varying lengths of time in concrete rearing ponds, and then liberated into Elk River or other nearby streams. This hatchery, located in Curry County, was constructed under P.L. 89-304 and put into operation in October 1968.

Oregon AFC-45 — Kelly R. Conover — Completed 1973 $107,100

Rear and release salmonids at the Trask River rearing pond - Provided for operation of 1/3-acre salmon rearing pond on the East Fork of Trask River. About one-half million coho smolts were reared and released in the East Fork or adjacent streams.

Oregon AFC-47 — Carl Copper — Completed 1973 $183,000

Operation of the Elk River salmon hatchery - Objectives were to collect and spawn adult salmon, receive eggs from other hatcheries, incubate the eggs, and rear the resulting fingerlings for release in Elk River and adjacent streams. Annual production is about 1 million yearlings comprised of fall chinook, coho, and steelhead.

Oregon AFC-49 — Carl Copper — Completed 1973 — $76,500

Operation of rearing ponds - North Nehalem River salmon hatchery - Objectives were to collect and spawn adult salmon, receive eggs from other hatcheries, incubate eggs, and rear resulting fingerlings for release into North Nehalem River or adjacent streams.

Texas 2-88-C — Terrance Leary — Completed 1969 — $16,700

Dredging boat and water-intake channels - Boat and water-intake channels were dredged at the Coastal Fisheries Experiment Station near Palacios, Calhoun County.

Washington AFC-1 — Marshall Thayer — Completed 1967 — $392,000

Salmon rearing operations - This project permitted full operation of 11 State-owned salmon hatcheries from July 1, 1966, to June 30, 1967. The Cooperator estimated that 264,375 coho and 145,425 chinook salmon thus would be made available to the fisheries which would otherwise have been lost.

PLANNING

Twenty-nine projects for development of research plans, reporting system, maps, streams catalogs, and inventories to assist the States in management of their fishery resources and supporting environments have been funded in 15 States and the Virgin Islands. Of these projects, 26 have been completed at a total cost (both State and Federal) of $1,535,270 and 3 are continuing at a total cost of $433,800.

Alabama 2-34-R — Johnie H. Crance — Completed 1970 — $214,710

Cooperative Gulf of Mexico estuarine inventory (Alabama) - This study of the estuarine areas was Alabama's part of a Gulf of Mexico estuarine inventory in cooperation with other Gulf States and the National Marine Fisheries Service. The inventory included the physical and biological characteristics of each estuarine zone to the 10-fathom isobath and consisted of four phases: area description, hydrology, sedimentology, and biology.

Alabama 2-143-R — Edwin B. May — Completed 1971 — $7,830

Evaluation and planning of Alabama's marine resources and research and development requirements - Plans for research and development programs related to specific fisheries problems and establishing objectives and priorities in accordance with available funds and facilities were developed.

Alaska 5-12-C — G.L. Ziemer — Completed 1967 — $15,000

King Salmon headquarters - architectual plans - Master plan and specifications for the formation of a headquarters at King Salmon for the important Bristol Bay fishing area were completed.

Alaska 5-14-D — James W. Parker — Completed 1968 — $4,000

Southeastern and Kodiak Island, Alaska, stream catalogs - Salmon escapement catalogs for southeastern Alaska Districts 10-15 for 1965-66 and for Kodiak 1965-67 were published.

Arkansas 4-12-D — William M. Bailey — Completed 1971 — $49,060

Commercial fishery industry survey - The purpose of this study was to develop a statistical reporting system for all the commercial fisheries in the State of Arkansas. Fish farmers and commercial fishermen were interviewed to establish the base for refined surveys.

Hawaii H-3-R — Michio Takata — Completed 1966 — $4,000

Central Pacific Tuna Conference - Provided for conference to outline research needs and program on bigeye, skipjack, and yellowfin tunas.

Hawaii H-9-R — Michio Takata — Completed 1966 — $5,000

Publication of Central Pacific Tuna Conference proceedings and background papers - Provided for publication of proceedings of the Governor's conference on Central Pacific fishery resources, as well as background papers utilized during the conference.

Louisiana 2-190-R — Charles White — $72,000

Development of an area management concept for Gulf penaeid shrimp - The purpose of this study is to develop a data base for implementation of shrimp management on an area basis rather than the present Statewide basis. Also, information would be obtained to correlate relationships between selected hydrological conditions and penaeid shrimp populations.

Maine FWAC-1,2 — Phillip Goggins — Completed 1972 — $48,116

Statewide comprehensive fish, wildlife, and marine management plan - Provided for development of a management plan which will maintain at an optimum level through biological and ecological research on fish and wildlife resources.

Maine AFSC-11 — Robert L. Dow — Completed 1969 — $2,852

Statewide comprehensive fish and wildlife management plan - Knowledge and ideas on the anadromous fishery resources as the initial step leading to an overall management plan for fish and wildlife resources of the State were assembled.

Maine AFSC-13 — Robert L. Dow — Completed 1972 — $42,412

Statewide comprehensive fish, wildlife, and marine management plan - The objective of this project was the formulation of a Statewide plan to provide for the conservation, including natural use, of the marine fish resources.

Michigan AFSC-8 — Ron Rybicki — Completed 1971 — $120,000

Great Lakes fish resource development study - This project was undertaken to develop a study outline for an evaluation of the current fisheries management programs on Lakes Huron, Michigan, and Superior.

Mississippi 2-25-R — J.Y. Christmas — Completed 1970 — $396,000

Cooperative Gulf of Mexico estuarine inventory and study, Mississippi - This study of the estuarine areas of Mississippi is part of a Gulf of Mexico estuarine inventory in cooperation with other Gulf States and the National Marine Fisheries Service. The inventory includes the physical and biological characteristics of each estuarine zone to the 10-fathom isobath and consists of four phases: area description, hydrology, sedimentology, and biology.

Mississippi 2-111-R — J.Y. Christmas — Completed 1970 — $30,000

Coordination and planning, fisheries resources research and development, Mississippi - The purpose of this project was to identify fishery research and development requirements for the enhancement of commercial fishery resources and to coordinate research under Public Law 88-309 with other State and Federal agencies and other research organizations.

New York 3-9-D — William Pearce — Completed 1970 — $120,000

Management planning for New York freshwater commercial fisheries - Plans were developed for better utilization of New York freshwater fish resources, including expansion of fisheries for underutilized species.

New York 3-119-R — William A. Pearce — Completed 1970 — $24,000

Development of New York State's freshwater commercial fisheries - The objective of this project was to develop an overall commercial fisheries management plan for Lake Ontario, eastern Lake Erie, and associated waters within New York State boundaries.

North Carolina 2-139-R — Walter F. Godwin — Completed 1971 — $14,930

Plan for fisheries resources research and development, North Carolina - Under the project the relative status of the commercial fisheries and needs were determined and a 5-year research and development plan was developed.

North Carolina 2-175-R — Maury Wolff — $75,000

Survey of nursery areas in western Pamlico Sound - This project supplements the State's effort to obtain current information on the important fishery resources and to map the waters supporting them. Nursery grounds utilized by these species will be identified and mapped.

Oklahoma 2-140-R — Gary Mensinger — Completed 1972 — $2,880

Planning for the development of the commercial fishery in Oklahoma - Problems related to reservoir-type commercial fisheries were identified based on accumulated information under completed projects. Then, a program plan was developed around potential fisheries for minnows, freshwater mussels, and fish farming.

Oregon AFCS-20 — Edwin K. Holmberg — Completed 1969 — $129,290

Evaluate, coordinate, and plan Pacific salmon research and management activities on a coastwide basis - The Salmon Compendium was updated through 1965 under supervision of the Pacific Salmon Inter-Agency Council.

Rhode Island 3-80-D — George W. Gray — Completed 1969 — $22,100

Development of a management plan for sea scallops in Rhode Island waters - Scallop beds were sampled on a monthly basis to determine meat yield, weight, length, and growth. Catch records were recorded also.

Texas 2-66-R — William R. Moore — Completed 1968 — $5,490

Experimental pond research planning - Research program was developed for saltwater pond experiments at the newly constructed Seabrook Laboratory as Public Law 88-309 activity.

Virgin Islands 2-161-R — Arthur E. Damman — Completed 1971 — $5,600

Planning for Virgin Islands fisheries program - To reconcile the Island's biological, economic, social, and political factors into a workable plan that will provide maximum benefits to the fisheries, a plan was developed for implementing a 5-year program of research and development.

Washington AFC-8 — Robert Kramer — Completed 1968 — $20,000

Stream improvement planning - Coastal streams were surveyed, and priorities assigned to each one for improvement based on needs and cost/benefit analysis.

Washington AFC-37 — Walt Williams — Completed 1971 — $52,000

Stream catalog - Puget Sound and Chehalis region - Accumulated information gathered in the Puget Sound and Chehalis River Basin resource study concerning physical and environmental stream characteristics and anadromous fish species utilization in the watersheds of Puget Sound and Chehalis drainage systems was cataloged.

Washington AFC-40 — Russell Jones — Completed 1971 — $67,000

Design for future program construction - Construction plans, specifications, and cost estimates were prepared for about nine projects scheduled to be undertaken under P.L. 89-304.

Washington AFC-51 — Marshall Thayer — Completed 1972 — $132,000

Design for Humptulips salmon hatchery - A design for a salmon hatchery with an initial capacity for production of 100,000 pounds of young salmon was completed. The proposed station would be located on Humptulips River, Grays Harbor County.

Washington AFC-60 — Walt Williams — $16,000

Coastal stream catalogue assembly - Accurate maps with descriptions of coastal streams, excluding Grays Harbor drainage, are prepared to aid in development of research plans.

RESEARCH

Research is the backbone of the program where almost $26 million or about 54 percent of the funds are used. A total of 378 research projects have been approved and funded. Of these, 55 are concerned with the environment, 67 with freshwater finfish, 151 with marine finfish, 12 with jellyfish, 2 with marine worms, and 92 are concerned with shellfish.

ENVIRONMENT

The 55 research projects on the environment are concerned mainly with inventories of the estuaries and how alteration of the environment affects fish and other communities.

Estuarine:

Projects have been funded mainly to improve streams, to evaluate certain factors affecting the estuaries, and to study chemical and physical characteristics of the estuarine environment as related to fishery resources. Of the projects funded, 27 have been completed at a total cost of about $1.8 million and 8 are continuing at various stages of completion at an estimated total cost of more than $1.2 million.

Alabama 2-119-R — Edward I. Bault — Completed 1971 — $12,100

A survey of the benthic organisms in coastal streams and brackish waters of Alabama - The distribution and abundance of benthic animals in coastal streams and low salinity waters in Baldwin and Mobile Counties were determined. Also, the distribution and abundance of these animals to hydrological and polluted conditions and to what extent they are utilized as food by commercial fish species were investigated.

Alabama 2-149-R — Eddie B. May — Completed 1973 — $61,000

The circulation and tidal flushing of Alabama's estuaries and the effect of shell dredging on suspended solids - This project provided for a study of the flushing rate and flow patterns in Mobile Bay estuaries as related to pollution and the dispersion of suspended solids in shell dredging areas as related to sedimentation.

Florida 2-53-R — Edwin A. Joyce, Jr. — Completed 1970 — $86,720

A study of the effects of a commercial hydraulic clam dredge on benthic communities in estuarine areas - In Tampa Bay, Indian River, Apalachicola Bay, and Ten Thousand Islands, the effects of hydraulic dredging on finfish, crustaceans, and invertebrates important in the fisheries food chain in estuarine areas were investigated.

Georgia 2-116-R — W.W. Anderson — $103,000

Studies on the ecology of Georgia's estuarine waters - This project provides for a study of the composition, distribution, and abundance of principal species of commercial fish inhabiting or utilizing estuarine environment along the Georgia coast. Ecological and biological factors associated with the species activities are investigated also.

Louisiana 2-22-R — J.D. Broom — Completed 1970 $784,740

Cooperative Gulf of Mexico estuarine inventory and study - This project was undertaken to: (1) study the composition, general distribution, and relative abundance of the commercial (or potentially) important marine fauna in the estuaries and near offshore waters of the Louisiana coast, as well as ecological factors influencing this fauna, and (2) determine possible means of preserving the estuarine areas.

Louisiana 2-168-R — Conrad L. Juneau — $46,000

An inventory and study of the Vermilion Bay-Atchafalaya Bay estuarine complex - Information is obtained on the composition and abundance of important fauna, physical and chemical characteristics, and sediment distribution pattern in the estuarine waters of the Vermilion Bay-Atchafalaya Bay complex.

Louisiana 2-188-R — Johnie W. Tarver — $45,000

An inventory and study of the Lake Pontchartrain-Lake Maurepas estuarine complex - The purpose of this study is to investigate the composition, general distribution, and relative abundance of commercially or potentially important fauna in an estuarine area adjacent to the City of New Orleans which is subject to a variety of stresses such as filling for construction and development, dredging, and pollution from oil and gas wells.

Louisiana 2-189-R — Gerald Adkins — $66,000

A study of the fauna in dredged canals of coastal Louisiana - Information is being obtained on the composition, general distribution, and relative abundance of the fauna, and on selected chemical and physical parameters, in dredged canals so that relationships between the environment and the fauna can be determined.

Louisiana AFCS-1 — James T. Davis — Completed 1970 $78,880

Ecological factors affecting anadromous fishes of Lake Pontchartrain and its tributaries - About 8,000 fingerling striped bass were released at four sites in the Tchefuncte River to evaluate the feasibility of establishing runs by planting hatchery-produced fish. Alabama shad and Atlantic sturgeon were collected with trawl and trammel nets in Lakes Pontchartrain, Borgne, and Maurepas, and with hoop net and electrofishing in tributary streams.

Maine 3-170-R — D.E. Nelson — $20,000

Escalator dredge study - This project is undertaken to define present sediment conditions and status of marine plants and animals in subtidal and intertidal areas where there are known to be populations of clams. After the initial investigation, the areas will be dredged to investigate the effects of the dredging on the marine life and the environment within and adjacent areas.

Maryland 3-26-R — D.W. Pritchard — Completed 1967 $21,000

Studies of the physical and chemical properties of the estuarine environment associated with fish kills - A monitoring program by the Johns Hopkins University provided several hundred temperature, salinity, dissolved oxygen, and pH observations on Upper Chesapeake Bay. Also, surveys of fish kills and studies of blue crab movements were made in cooperation with the monitoring program.

Maryland 3-30-R — J.R. Schubel — Completed 1969 $81,206

Suspended sediments in the Upper Chesapeake Bay - Suspended materials were collected monthly at the surface, mid-depth, and near the bottom at each of 31 stations in the Upper Chesapeake Bay from the Susquehanna River mouth to Pooles Island. The properties of the suspended materials are being used to determine the relative importance of the several origins. This project was transferred for funding under Public Law 89-304 (See Maryland AFC-4).

Maryland 3-93-R — H.T. Pfitzenmeyer — Completed 1971 — $50,000

Effects of Maryland hydraulic dredge on softshell clams - This project was to determine how seasonal hydraulic clam dredging affects present populations and recruitment of juvenile softshell clams. An area of the Maryland portion of Chesapeake Bay was used for the removal of clams and mechanical disruption of the bottom.

Maryland AFC-4 — J.R. Schubel — Completed 1970 — $45,000

Suspended sediments in Chesapeake Bay - This project was a followup of Maryland 3-30-R conducted under Public Law 88-309. It provided for an estimation of the relative contribution to suspended sediments in Chesapeake Bay from various sources and an estimation of the amount of sediment which escapes Upper Chesapeake Bay.

Maryland AFC-5 — J.R. Schubel — Completed 1971 — $85,000

Suspended sediments in Chesapeake Bay - The effects of suspended sediments on the development of anadromous fish eggs and larvae in Upper Chesapeake Bay and the source and characteristics of these sediments were investigated.

New Jersey 3-114-R — Sidney S. Herman — Completed 1971 — $21,313

A study of the base food chain relationships in coastal salt marsh ecosystems - This study was to evaluate the meiobenthic communities, their abundance, composition, and distribution, relative to the physical and chemical conditions of the overlying water and the sediment.

New Jersey 3-137-R — Paul E. Hamer — $70,000

Inventory of major estuarine systems - The species of fish which inhabit estuaries and their distribution, the chemical and physical attributes of the estuaries, and the uses man makes of these waters are determined.

North Carolina 2-9-R — Austin B. Williams — Completed 1967 — $20,683

Studies on macroplanktonic crustaceans and ichthyoplankton of the Pamlico Sound complex - Data are obtained on how relative abundance and movement of larval shellfish and marine finfish are related to environmental changes caused by phosphate mining and other engineering projects.

Oregon 1-77-D — C. Dale Snow — Completed 1973 — $92,000

Estuary resource surveys - A resource use survey was made in 16 estuaries along the Oregon coast, including an assessment of the potential contribution of clams to the fisheries. These data were used to build up the Fish Commission's defense of these areas against loss by industrialization and other developments.

Puerto Rico 2-153-R — Robert Y. Ting — Completed 1972 — $42,000

The determination of mercury in commercially important aquatic organisms - The purpose of this study was to examine the possible pathway of concentrations of mercury found in commercially important fish, except tuna, and invertebrates and to determine levels of concentration.

Texas 2-12-R — Roy B. Johnson, Jr. — Completed 1970 — $72,610

An evaluation of the effects of estuarine engineering projects - Physical and biological data were obtained on how various engineering projects affect the ecology of Galveston Bay.

Texas 2-112-R — Roy B. Johnson, Jr. — Completed 1972 — $67,536

Ecological changes associated with the industrialization of Ceday Bayou and Trinity Bay, Texas - The ecological changes brought about by discharge of waste from a steel mill into the lower reaches of Cedar Bayou were determined. Also investigated were the effects of channel development and reversal of flow in the Bayou by the power company, and the effects of effluent from the power station on the ecology in Trinity Bay.

Texas 2-155-D — Richard L. Benefield — Completed 1973 — $38,771

Evaluation of effects of various coastal construction methods - This project was to determine the best procedure for marine construction work in estuarine areas for minimal habitat destruction along the Texas Gulf coast and produce a manual with guidelines for processing marine construction permits.

Texas 2-160-R — Edward Bradley — $80,156

Determination of freshwater quantity standards for the Guadalupe estuary and San Antonio Bay system, Texas - Objective of this study is to obtain information to establish water allotments and water quantity standards for the Guadalupe estuary.

Texas 2-200-R — Roy Johnson — $27,100

Fishery survey of Cedar Lakes and the Brazos and San Bernard estuaries - This project will investigate the biota and hydrography of the estuaries; survey nursery habitat, the fishery status and potential; and recommend procedures to maintain and/or improve fishery habitat.

Virginia 3-19-R — Edwin B. Joseph — Completed 1967 — $82,645

Characteristics of coastal estuarine fish nursery ground as natural communities - The features of low-salinity nursery areas of the York River estuary suitable for larval and juvenile fishes of the coastal area are described. Also, the distribution and abundance of several important species were determined.

Washington AFC-59 — Roy C. Johnson — Completed 1973 — $22,000

Spawning ground improvement - gravel loosening - The objective of this study was to develop techniques for improving stream gravel areas where potential salmon egg production exists but siltation precludes successful spawning or survival of deposited eggs. Studies were made in Dungeness and Stillaguamish Rivers entering Puget Sound in pink and chum salmon production areas.

Freshwater:

Twenty-two projects have been funded involving improvement of aquatic environment by removal of barriers to fish passage and spawning bed adjustments, effects of logging and thermal pollution on water quality, and study of physical and chemical characteristics of freshwater environment. Of the projects funded, 20 have been completed at a total cost of more than $1.5 million, and 2 are continuing at various stages of completion at an estimated total cost of more than $0.5 million.

Alaska 5-8-R — Kenneth E. Durley — Completed 1969 — $73,300

Monitoring the effects of land use on salmon production - The U.S. Forest Service and the Alaska Department of Fish and Game developed a monitoring program designed to detect environmental changes in streams before, during, and after logging. The project provided for monitoring of selected pink salmon streams in southeastern Alaska.

Alaska 5-19-R — John Valentine — Completed 1970 — $20,800

Effects of land use in salmon production - The joint monitoring effort of the U.S. Forest Service and the Alaska Department of Fish and Game was extended for 1 year to complete the data analysis, to recommend future goals for this project, and to continue certain aspects of current data collection.

Alaska 5-28-R — Alan P. Kingsbury — $72,000

Relationships between logging activities and salmon production - This study continues work completed under 5-24-R. It will shift objectives and methodology in that results obtained will be used to guide logging plans to minimize adverse effects on salmon. Survey-type studies over broad areas where logging is imminent will be emphasized.

Alaska AFC-3 | Robert S. Roys | Completed 1970 $342,400

Restoration and rehabilitation of earthquake-damaged pink and chum salmon streams in Prince William Sound, Alaska - Restorative work was completed on about 30 of the 181 salmon streams that were damaged by violent topographic changes during the March 1964 earthquake in southeastern Alaska. Survival of eggs and alevins was correlated with hydraulic data in the damaged zones and compared with similar data from "normal" zones.

Alaska AFC-30 | John Solf | $84,300

Stream rehabilitation, Prince William Sound - The objectives of this project are to continue restoration of earthquake-destroyed pink and chum salmon runs in Prince William Sound and rehabilitation of spawning areas where production has been seriously curtailed. Thus far under project AFC-3, 29 streams have received remedial treatment through an effective stream improvement program. Under this project, restoration of 25 damaged streams is underway and restocking has begun where necessary to rebuild runs.

Arizona 4-19-R | W.L. Minckley | $25,325

Influence of pump storage and generation on commercial fisheries potential of reservoirs - Objectives of this study are to determine the effects on fishes and their habitat of a pump storage regulation system installed in two dams in the Salt River chain, and to obtain data concerning pump storage and its effect to be of value in the planning and construction of similar units from the standpoint of aquatic resource values.

Arkansas 2-166-R | R.V. Kilambi | $30,500

Effects of cage culture fish production upon the biotic and abiotic environment of Crystal Lake - Before and after cage culture of catfish and trout fish populations, water quality, and bottom fauna will be measured to note changes.

California AFC-7 | John Hayes | Completed 1968 $147,000

Anadromous fish water requirements - Surveys of salmon and steelhead trout spawning and nursery areas in Van Duzen River and North Fork of Eel River were completed. Water requirements for seaward migratory juvenile salmonids and the relation between water discharge and usable spawning gravel were investigated.

Kentucky 4-48-R | Hunter M. Hancock | Completed 1970 $60,000

Influence of the effluent from a concentrated industrial complex on a large river - Murray State University made a 2-year study to determine how effluent released into the Tennessee River affects the distribution of fish, water quality, and the chemical composition of bottom muds, benthos, and fish tissue.

Maryland 3-23-R | William Roosenburg | Completed 1967 $17,488

Study of the effects of thermal pollution on oysters in the Patuxent River estuary - A study of oyster growth, mortality, gonad development, and condition has been completed in the upper Patuxent estuary. Stations were located 1,000 feet to 7 miles from the heated water outfall of a new stream electric generating plant. Results showed that growth was lower near the plant than those farther removed. Mortality was low and normal for all stations.

Maryland AFSC-1 | William R. Carter | Completed 1970 $225,300

Ecological study of Susquehanna River and tributaries below Conowingo Dam and their contribution to the anadromous fish populations of Upper Chesapeake Bay and the development of methods to eliminate massive fish mortalities below Conowingo Dam - Observations were made on the migratory behavior of adult clupeids during their upstream movement into the Susquehanna River and two major tributaries, Deer Creek and Octararo Creek. Fish were captured by pound net at the river mouth, marked with anchor tag, and released. Weekly measurements were taken at five stations on water temperature, pH, conductivity, dissolved oxygen, and turbidity.

Maryland AFC-3 — C. Jay O'Dell — Completed 1970 — $218,272

Stream improvement program for anadromous fish management - This project included activities that range from a basic survey of all Maryland streams that provide or have a potential for providing spawning habitat for anadromous fish to their ultimate improvement and maintenance. Obstructions to free passage of fish were corrected where practicable. For streams where biological information is lacking or perhaps obsolete, an inventory of biological productivity was obtained.

Minnesota AFC-2 — Richard Hassinger — Completed 1968 — $16,000

Anadromous fish habitat development - A survey was made of the needs for improvements of spawning habitat and streams used by Great Lakes fish that enter streams tributary to the North Shore of Lake Superior.

North Dakota 4-55-R — John Owen — $27,000

A determination of nutrient exchanges and biological nutrient removal from Lake Ashtabula, North Dakota - Sources of nitrates and phosphates and nutrient exchanges were determined, the purpose being to gain information to assist in the development of a long-term management plan for Lake Ashtabula relative to yellow perch and bullhead fisheries.

Ohio AFCS-1 — C.E. Herdendorf — Completed 1970 — $118,000

A study of the physical characteristics of the major reef areas in the western basin of Lake Erie - The Ohio Geological Survey determined the physical characteristics of the major reefs, collected and analyzed bottom sediment, measured currents and water quality, and prepared topographic maps of five bedrock reefs.

Oklahoma 4-24-R — Robert Summerfelt — Completed 1969 — $71,260

Commercial fisheries investigations - The relation between sediment type and the distribution and abundance of invertebrates and fishes was studied at Lake Carl Blackwell. Sediment surveys were made semiannually at five selected sites along each of 30 transects across the lake. Biological and hydrographic data were also collected.

Oregon AFC-23 — James D. Hall — Completed 1970 — $64,400

Effects of logging on salmon populations in coastal streams - Data on spawning populations, juvenile survival, production, and yield of smolts from three coastal streams during one 7-year prelogging inventory were summarized for publication. Field data were collected on abundance of juvenile salmon after the area was logged.

Oregon AFC-46 — James D. Hall — Completed 1973 — $83,000

Effects of logging on abundance of coho salmon - This study was part of the Alsea Watershed Program designed to determine the effects of Douglas fir logging practices on the physical and biotic resources in small coastal watersheds. This project determined the effects of timber harvest (clearcut vs. patchcut) on coho salmon rearing capacity of selected streams.

Tennessee 2-142-R — Eung Bia Shin — Completed 1972 — $20,000

Mechanisms of mercury transformation in bottom sediments - The project was undertaken at Vanderbilt University to determine the mechanisms by which the various forms of mercury are transformed into compounds such as methyl mercury, whether the type of soil is a factor in the process, and the detention time of mercury and its compounds in a lake or reservoir.

Washington AFC-23 — Marshall Thayer — Completed 1969 — $9,000

Cascade River stream improvement - Stream beds in two areas were altered by blasting and removal of rock to create water flow patterns and velocities favorable to passage of chinook and coho salmon with minimum delay to the upper Cascade River, Skagit County.

Washington AFC-24 Marshall Thayer Completed 1969
$11,000

Mashel River stream improvement - Adequate fish passage for upstream migrant salmon was provided through logjam obstructions. Clearance of the logjams will make about 20 miles of stream available to chinook and coho salmon for spawning and rearing.

Washington AFC-33 Robert W. Kramer Completed 1969
$5,000

Upper Mashel River stream improvement - Logjams were removed and stream gradient at cascades in small falls were reduced to provide passage for chinook, coho, and pink salmon to about 20 miles of spawning and nursery area in Mashel River tributary to the Nisqually River.

Washington AFC-39 Robert W. Cramer Completed 1970
$10,000

Upper Chehalis River stream improvement - The project provided for fish passage for upstream migrants at all stream flows at Fisk Falls in the upper Chehalis River. Approximately 19 miles of spawning and rearing areas were made available by the project. The stream areas to be opened are suitable for production of chinook and coho salmon.

Marine:

Three projects have been funded, all of which are completed at a total cost of $276,465.

Alaska 5-9-R Peter B. Jackson and Jerry A. McCrary Completed 1969
$122,700

Investigation of ecological factors limiting production of the Alaska pandalid shrimp - Data were collected in southeastern Alaska for determination of age and growth, length-weight relation, sex changes, and ovigerous period of the pink and side-striped shrimps; similar, but not as extensive, data were collected for the humpy and spot shrimps.

Maryland 3-56-R Charles H. Southwick Completed 1969
$39,965

Biologic and environmental control of Eurasian milfoil (Myriophyllum spicatum L.) in Chesapeake Bay - Excessive milfoil growth is an environmental problem that affects fish population abundance and growth and the proper utilization of fishery resources. This project was a biological study of Eurasian milfoil in upper Chesapeake Bay and tributaries, including Middle River, Seneca Creek, Back River, Saltpeter Creek, West River, and Rhode River. The aim was to find a means of biologic control.

Mississippi 2-42-R J.Y. Christmas Completed 1969
$112,150

A seasonal study of nektonic and benthic faunas of the shallow Gulf off Mississippi out to the fifty-fathom curve - Monthly semiquantitative collections were made of the benthic fauna and the floating components, chiefly neuston, in the water layer of the Gulf off the Mississippi coast out to 50 fathoms. Together with the current work in the bays and sounds, this study covered the marine-estuarine littoral and shore fishes and crustaceans of economic importance on the Mississippi coast.

FINFISH (FRESHWATER)

Sixty-seven projects have been funded for research on baitfish, buffalofish, carp, catfish, bullhead, lake herring, lake trout, paddlefish, rainbow trout, sucker, whitefish, and walleye. Of the projects funded, 48 have been completed at a total cost of more than $2.4 million, and 19 are continuing at various stages of completion at a cost of more than $1.7 million.

Baitfish:

Arkansas 2-162-R Raj V. Kilambi $25,000

Effects of quality and quantity of food on golden shiner production - Growth of golden shiner in relation to quality and quantity of commercial diets and stocking densities under different water temperatures will be determined. Research will be done at the University of Arkansas, Fayetteville.

Colorado 6-2-D — Robert E. Vincent — Completed 1970 — $178,000

Raising bait fishes in the Rocky Mountain States - The fathead minnow, Pimephales promelas, which is a native to Colorado, was considered for commercial production and sale as bait minnow in the Rocky Mountain area. Growth and mortality of this species as influenced by population density in experimental ponds were investigated.

Hawaii H-10-R — Garth I. Murphy — Completed 1969 — $26,000

Handling baitfish in Hawaii - Physiological studies were conducted on concentrations of lactic acid in the muscle of anchovy as a cause of mortality during captivity. Feeding and holding procedures that would permit indefinite confinement of this baitfish were investigated.

Nevada 6-9-D — James E. Deacon — $25,545

Rearing baitfishes in the desert Southwest - This project is designed to determine the present volume and value of baitfish by species and the present sources and capability for expansion and to estimate future market needs based on present and projected visitor-use of the Lake Mead Recreation Area. Nevada Southern University is making this study.

Vermont 3-59-R — Jon K. Anderson — Completed 1970 — $7,500

Investigation of commercial fisheries potential of Lake Champlain - Information was obtained on the number and activities of live bait supplies along the lake to determine the economic value of the bait industry and seasonal demand for specific types of bait. This study was also concerned with the relative distribution and abundance by species and weight of existing fish populations which may be harvested commercially.

West Virginia 3-173-R — Carl B. Schreck — $19,188

Impact of commercial use of wild bait species - The impact of commercial harvest of natural populations of bait species in Rich Creek, tributary of New River, will be evaluated and the effects on population structure determined.

Buffalofish and carp:

Arizona 6-1-R — W.L. Minckley — Completed 1969 — $28,510

Investigation of commercial fishery potential in reservoirs - Populations of buffalofish, carp, and threadfin shad in reservoirs in central Arizona and lower Colorado River were investigated. Feasibility of harvesting these fishes on a sustained commercial basis was investigated. Production and marketing possibilities for the products were surveyed.

Arizona 6-11-R — W.L. Minckley — Completed 1972 — $72,240

Commercial fisheries potential of reservoirs - This was a continuation of project 6-1-R to investigate the populations of buffalofish, carp, and threadfin shad in reservoirs in central Arizona and lower Colorado River and Lake Mead.

New Mexico 6-11-R — Douglas B. Jester — Completed 1972 — $58,000

Investigation on commercial fishery potential of rough fish species - New Mexico State University gathered and analyzed data to determine the feasible utilization of underused fish species in Elephant Butte and Caballo Reservoirs. The population structure, growth characteristics, seasonal movement, concentrations, and harvest methods for the buffalofishes, river carpsucker, carp, and gizzard shad were investigated also.

New Mexico 2-198-R — Douglas B. Jester — $18,186

Experimental harvest of "rough" fishes from Elephant Butte Lake, New Mexico - The effects of various baits on catch rates of fishes in gill nets will be investigated, and the effects of selective harvest of small-mouth buffalo, river carpsucker, and carp on fish populations will be determined.

Wyoming 1-48-R — George T. Baxter — Completed 1971 $121,616

Commercial potential of non-game species in impounded waters - University of Wyoming made population studies at Ocean Lake and Seminoe Reservoir to estimate the potential abundance of non-game fish species, primarily carp and white sucker.

Channel catfish and bullhead:

Arkansas 4-53-R — R.V. Kilambi — Completed 1971 $28,000

Influence of temperature and photoperiod on growth, food consumption, and food conversion efficiency on blue catfish, Ictalurus furcatus (Lesueur) - This project provided for an evaluation of the influence of temperature and photoperiod on growth, food consumption, and food conversion efficiency of the fingerling blue catfish and an investigation of the changes in the above processes brought about by the age of the experimental fish.

Illinois 4-50-R — William M. Lewis — Completed 1972 $51,120

Significance of ionic content of water in determining the growth and handling quality of channel catfish - Determined if the various dissolved salts in water have a detectable effect upon the growth and handling quality of channel catfish under conditions of dense populations characteristic of fish farming.

Iowa 2-178-R — James Mayhew — $15,000

Channel catfish investigations - Project objectives are to determine causes for variation in year class strength of channel catfish in pools 9, 11, 13, and 18 of the upper Mississippi River. Also, a survey technique for assessment of year-class abundance of commercial harvest will be developed and evaluated.

Kansas 4-1-R — O.W. Tiemeier and C.W. Deyoe — Completed 1968 $65,740

Investigation on digestion and metabolism of the channel catfish - Six ponds at the Tuttle Creek Fisheries Research Laboratory near Manhattan were each stocked with 300 age-class II channel catfish. Fish in three ponds were fed formulated freshwater fish meal, and fish in the other three ponds were fed formulated marine fish meal. At 2-week intervals the fish populations were sampled to study growth under various feeding regimes during various seasons

Kansas 4-45-R — O.W. Tiemeier and C.W. Deyoe — Completed 1971 $72,840

Investigations on nutrition and metabolism of catfish and utilization of fisheries products - This study, subcontracted to Kansas State University, provided additional information on the nutritional factors affecting channel catfish. Carbohydrate and energy utilization during feeding, during the period of nonfeeding, and under varying temperature conditions were studied. Experiments on protein metabolism were also underway.

Kansas 2-170-R — O.W. Tiemeier and C.W. Deyoe — $29,720

Investigation on nutrition and metabolism of the channel catfish - This study will add knowledge to feed requirements and evaluate new feedstuffs as nutrient source for channel catfish.

Kentucky 4-27-R — Hunter M. Hancock — Completed 1968 $25,880

Catfish fishery investigations - Murray State University Biological Station investigated the catfish fisheries on Kentucky Lake from Kentucky Dam to the Tennessee State line. Various size hoop nets were fished under different conditions to determine how efficient and selective these nets are in catching channel and blue catfishes.

Kentucky 4-70-R — Hunter M. Hancock — Completed 1972 $9,000

Kentucky Lake commercial catfish catch analysis - Commercial catch composition, age, growth and condition of Kentucky Lake catfish were investigated by Murray State University Biological Station.

Minnesota 4-44-R — Charles Burrows — Completed 1970 — $13,500

A physiological study of thermal stress in channel catfish - This study was primarily concerned with how temperature changes in rivers affect the catalytic properties of heptic catalese enzyme in channel catfish. An attempt was made to characterize this enzyme in the livers of fish taken from thermally unpolluted waters.

Missouri 2-164-R — Eugene McDonald — Completed 1972 — $4,807

Influence of light intensity on food conversion of channel catfish - Four experimental troughs were used at light intensities of total darkness, low, intermediate, and full to determine if feeding rate of channel catfish is a function of light intensity. Duplicate lots of 9-inch and 3-inch fish were stocked at each intensity and held for 21 days' observation.

Missouri 2-187-R — W.A. Rogers — $8,667

Anatomical and histological description of the channel catfish - The objective of this study is to describe the gross anatomy of the channel catfish, including histological description of the tissues in the integument, gills, alimentary tract, liver, spleen, heart, blood, kidney, gonads, urinary bladder, gall bladder, musculature, and skeletal system.

North Dakota 4-15-R — John Owen — Completed 1970 — $30,000

Garrison Reservoir commercial fisheries investigations - The life histories of catfish, goldeye, and yellow perch were studied. Also investigated was the behavior of these fish in response to physical factors, such as turbidity, which are associated with reservoirs.

North Dakota 4-30-R — John Owen — Completed 1969 — $18,300

A study of the commercial fishery potential of Lake Ashtabula - Movements, growth, and population structure of bullheads and yellow perch were investigated. Also, population density and rate of growth before and after harvest were investigated.

North Dakota 4-69-R — John Owen — Completed 1973 — $25,500

Lake Sakakawea commercial fisheries investigations - The objectives of this project were to study the movement of channel catfish, basic biology of the river carpsucker in Lake Sakakawea, and growth of goldeye in Lakes Sakakawea and Oahe.

Ohio 4-6-R — Russell Scholl — Completed 1969 — $53,462

Lake Erie commercial fisheries research - Methods of predicting the harvestable crops of channel catfish and white bass and properly harvesting these resources were investigated in Sandusky Bay. Biological data and life history information were collected, and gill net selectivity was investigated.

Ohio 4-56-R — Russell Scholl — Completed 1970 — $17,500

Fisheries investigations - Lake Erie - Determinations were made of the economic and commercial importance of white bass and channel catfish in Lake Erie and Sandusky Bay, their relative abundance in Lake Erie and Sandusky Bay, and the effectiveness of various commercial gears upon these species so that accurate predictions of harvestable crops can be effected.

Oklahoma 4-60-R — Robert Summerfelt — Completed 1971 — $34,000

Flathead catfish movements - The homing range and the homing ability of flathead catfish and environmental factors which influence this species' activities and movements were investigated. Also, population density, fishing, and natural mortality were determined.

South Dakota 4-29-R | Charles Backlund | Completed 1969 $20,300

Effects of intensive bullhead removal in selected lakes in eastern South Dakota - Three shallow fertile lakes in counties east of the Missouri River were fished continuously with bullhead pockets to reduce the bullhead populations to the lowest possible level. Measurements were made to determine how their removal affects their population structure and to determine what percentage of the younger bullheads must be removed to produce a vigorous population.

West Virginia 3-58-R | Roger Schoumacher | Completed 1969 $41,250

Investigation of the commercial potential of fishery resources in West Virginia - Commercial potential of channel catfish and mussels along the Ohio and Kanawha Rivers was investigated. The catch of nets set at selected locations along the Ohio River was evaluated for size and age composition of the catfish population.

Wisconsin 3-166-R | Richard Ranthum | $8,000

Effects of commercial fishing on winter congregations of catfish - The objective of this study is to determine if present commercial fishing regulations governing winter catfish congregations are effective in providing a stable catfish fishery in Pool 7 of the Mississippi River. Population estimates and contribution to the catch by various gears are determined.

Lake herring:

Minnesota 4-8-R | Charles R. Burrows | Completed 1969 $52,216

Minnesota commercial fisheries improvement - western Lake Superior - The University of Minnesota made a study to obtain life history information on species associated with the lake herring. Of special interest were food habits, distribution, and abundance.

Lake trout:

Michigan 4-2-R | Myrl Keller | Completed 1969 $129,044

Surveillance of lake trout restoration in Michigan waters of Lake Michigan - Lake trout stocks were assessed in the northerly areas of Lake Michigan where hatchery-produced lake trout were released and where sea lamprey control efforts began.

Michigan 4-59-R | Myrl Keller | Completed 1972 $143,000

Lake trout restoration studies - Objectives of the study were to assess and describe condition of introduced lake trout stocks in Michigan waters of Lake Michigan. Evaluation of the stocks proceeded in conjunction with programs to control sea lamprey and reestablish lake trout and other salmonid species.

Michigan 3-168-R | Leon V. Moffit | $37,997

Assessment of lake trout populations in Lake Michigan - This study is a continuation of project 4-59-R to evaluate progress and effectiveness of sea lamprey control on lake trout stocks in Michigan waters of Lake Michigan, and to determine survival of planted lake trout as affected by exploitation by commercial and sport fisheries, and predation.

Minnesota 4-38-R | Charles Burrows | Completed 1971 $37,500

Lake Superior commercial fisheries assessment studies - The primary aim of this work was to ascertain the condition of the lake trout and other commercial fish stocks in Minnesota waters of Lake Superior. To meet this aim, the progress and effectiveness of sea lamprey control in local areas and the survival and dispersal of stocked lake trout were investigated. The abundance and distribution of other commercial fish populations, as well as the commercial production, were also investigated.

Minnesota 3-151-R — Charles Burrows — $15,000

Lake Superior commercial fisheries assessment studies - The objectives of this study are to determine effectiveness of lamprey control on lake trout stocks in local areas, survival and dispersal of stocked lake trout, size and age distribution of trout and other commercial species, and natural reproduction in lake trout stocks.

Wisconsin 4-7-R — Ronald Poff — Completed 1969 $115,665

Assessment of lake trout restoration in the Wisconsin waters of Lake Michigan - This project was a part of the broad assessment of fish populations, including lake trout, in Lake Michigan. Fish samples, scales, stomachs, and other biological data, as well as statistical records of the fisheries, were collected in Wisconsin waters of Green Bay and Lake Michigan.

Paddlefish:

South Dakota 4-61-R — Charles Backlund — Completed 1971 $8,800

Paddlefish population study - Information was obtained for management to maintain a balanced harvest of paddlefish based on the potential of the resource.

Rainbow trout:

Utah 6-10-R — Clair B. Stalnaker — Completed 1970 $42,000

Investigation of the intensity of natural selection upon different phenotypes (blood types) of rainbow trout in commercial trout rearing ponds and reservoirs - The work was carried out at the Utah Fish and Game Department's Experimental Fish Hatchery at Logan and the Utah State University Fisheries Laboratory. Information was obtained on blood groups among the breeding stock of rainbow trout used as brood stock for the fingerlings that are given commercial trout farmers. Also tests were developed that will provide information on the genetic control of the blood types found. The major aim was to eliminate undesirable genotypes from the breeding population.

Utah 6-13-R — Clair B. Stalnaker — Completed 1973 $46,056

Genetic studies of rainbow trout strains being maintained by commercial and agency hatcheries - This project continued the State's research effort to upgrade techniques used in production of rainbow trout at hatcheries through selective breeding. The work was done at the Utah State University, Logan.

Suckers:

North Dakota 4-54-R — John Owen — Completed 1971 $3,500

Investigation of gonadatrophins in stimulating spawning in white suckers - The controlled spawning of white suckers was investigated as a possible means of obtaining bait minnows commercially. Of the intramuscular injections used, only fresh and dried pituitary and the HCG proved successful in inducing spawning.

Walleye:

Pennsylvania 3-67-R — Roger B. Kenyon — Completed 1970 $180,000

A study to establish a program to increase the production of high-value commercial fishes in Lake Erie - This project involved a study of the life history of the walleye, attempts to locate and propagate blue pike, and stocking of experimental coho salmon. It also provided equipment for a research vessel to study these fish and their environment in the eastern basin of Lake Erie.

Wisconsin AFC-2 — Russell Daly — Completed 1967 $15,064

Walleye population study in respect to a possible commercial fishery - Walleye were tagged and released between Port Wing and Superior Harbor on Lake Superior to estimate population size and to observe migration. Age and growth determinations were made by examination of scales.

Wisconsin AFC-8 George King Completed 1970
$2,000

Evaluation of commercial fishery potential of Wisconsin's boundary waters of Lake Superior - Migration patterns and population size of discrete walleye populations within the study area were investigated. The data accumulated will be used to determine whether the populations can withstand commercial fishing without endangering the resources.

Whitefish:

Wisconsin 3-169-R Ronald J. Poff $18,000

Assessment of whitefish and related species in Lakes Michigan and Superior - The purpose of this study is to obtain biological information on whitefish by monitoring commercial catches, maintaining index stations on spawning reefs, and assessing juvenile abundance.

Others:

Illinois 4-36-R George W. Bennett Completed 1970
$22,470

Physiological and behavioral relationships among species of fishes - Channel catfish, golden shiner, and tilapia were isolated as individual species, as well as combined in separate combinations, to observe growth rate. Conditions of direct antagonistic behavior and of metabolic or normal action within and between these species were observed also. Sam A. Parr Fisheries Research Center, Marion County, did this work.

Indiana 4-16-R Darryl Christensen Completed 1968
$20,900

Inland waters commercial fisheries studies - Studies were completed on the Wabash and White Rivers to evaluate the efficiency, extent, and harvest by commercial fisheries.

Indiana 3-150-R Thomas S. McComish $25,200

Interspecies relationships of fish in Indiana waters of Lake Michigan - Biological data are collected on the fishery resources of Lake Michigan waters of Indiana to fill a void that exists in the Great Lakes States and Fishery Commission efforts to obtain information for a better understanding of the fish population dynamics, status of the stocks, and their relationships.

Iowa 4-11-R James Mayhew Completed 1972
$161,000

Industrial and commercial food fish investigations - Evaluations were made of the potential yield of fish with commercial and industrial value in large inland streams and reservoirs. Methods were developed to properly use these fish.

Kentucky 2-186-R John C. Williams $34,000

Commercial fishery investigation of the Kentucky River - The purposes of this project are to determine the commercial fishery potential of the finfish and mussel fisheries in the Kentucky River and its three main tributaries, the North Fork, Middle Fork, and South Fork, and to evaluate the effects of selected pollutants on these resources.

Maryland AFC-8 C.J. O'Dell $101,400

Survey of anadromous fish spawning areas - The purpose of this project is to conduct an inventory of streams in Maryland to determine which support or have potential to support spawning runs.

Michigan AFC-1 Myrl Keller Completed 1967
$35,350

Appraisal of stocks of anadromous fishes in the Michigan waters of the Great Lakes - Scientific gear was purchased for the Michigan Department of Conservation's new research vessel Steelhead for research on commercial species in Lake Michigan.

Minnesota 4-39-R — Charles Burrows — Completed 1971 — $105,978

Minnesota commercial fisheries improvement - Factors determining the commercial catch of burbot, sauger, tullibee, and yellow pike in the American waters of Lake of the Woods were investigated. Catches were examined to determine the condition of the fish and size groups harvested.

Minnesota 3-143-R — Lloyd L. Smith — Completed 1973 — $41,639

Factors determining the relationships of the burbot to other associated species in Minnesota waters - Provides for an evaluation of the potential commercial importance of the burbot in the American waters of Lake of the Woods and its relationship with the production of other species such as walleye and sauger which support existing commercial fisheries in Minnesota waters.

Montana 1-19-D — James L. Cooper — Completed 1970 — $101,334

Fort Peck Reservoir fishery investigation - This project provided for complete inventory of the fish populations in the Fort Peck Reservoir and an investigation of methods for selective fishing by local fishermen. Commercial species harvested included carp, buffalofishes, goldeye, catfish, burbot, suckers, and yellow perch.

Montana 1-56-D — James E. Liebelt — $25,300

Commercial fisheries of Fort Peck Reservoir - Information on the life history, distribution, abundance, and availability of goldeye and buffalofish is obtained in Fort Peck Reservoir on the Missouri River.

Nebraska 4-4-R — Robert E. Thomas — Completed 1969 — $47,280

Establishment of the seasonal distribution and availability of commercial fish species in the waters of Nebraska - An electrical barrier and trap were used to collect fish on the North Platte River about 2 miles upstream from McConaughy Reservoir. Numbers, weight, time of capture, age composition, and sexual maturity were recorded for all species captured.

Nebraska 4-57-R — Monte Madsen — Completed 1972 — $88,000

Commercial fishery investigations - The primary objective of this project was to determine the potential and feasibility of a commercial fishery on the North Platte River.

Nebraska 2-196-R — Monte Madsen — $12,000

Evaluation of an electric weir as a harvest method for commercial fish - This study is designed to evaluate the fish harvest efficiency of the Lewellen weir on the McConaughy Reservoir by use of a downstream trapping device and mark and recapture program.

North Dakota 4-23-D — Dean Hildebrand — Completed 1967 — $4,500

A survey of commercial fisheries on the mainstem reservoirs of the Upper Missouri River System - To determine possible expansion of the commercial fisheries, the University of North Dakota has investigated Fort Peck Reservoir of Montana, Garrison Reservoir of North Dakota, and Oahe and Fort Randall Reservoirs of South Dakota.

Pennsylvania 3-167-R — Roger Kenyon — $58,740

A commercial fish study of the Eastern Basin of Lake Erie - The objective of this study is to assess the structure and status of the smelt and forage fish populations in the Eastern Basin of Lake Erie and to study the stability of yellow perch year classes.

Utah 1-82-R — Joseph R. White — $25,000

Commercial fisheries in typical large shallow eutrophic Rocky Mountain Lake - The potential for expanding the commercial fishery to bullhead in a Utah Lake is investigated. Also, the statistics on the sucker and carp fisheries are studied to evaluate the apparent decline in abundance of these fish.

West Virginia 3-96-R — Roger Schoumacher — Completed 1970 — $3,000

Commercial fishery investigations - Objectives for this project were to determine the abundance, distribution, and age of potentially commercial fishes in the Ohio and Kanawha Rivers. Also, statistics on the commercial harvest were collected from fish taken in the Ohio River.

West Virginia 3-128-R — Robert Mills — Completed 1973 — $20,000

Commercial fishery investigations - Provided for sampling fish from the Ohio River and major tributaries for mercury and other heavy metal concentrations.

Wyoming 1-80-R — George T. Baxter — $26,000

Feasibility of commercial exploitation of fish in impoundments - This project will evaluate the effect of commercial exploitation on the populations of both game, such as yellow perch, and commercial species of carp, sucker, and buffalofish in Ocean Lake and Seminoe Reservoirs. Information will be obtained on methods of fishing and dollar investment also.

FINFISH (MARINE)

One hundred and fifty-one projects have been funded with emphasis on Pacific salmon research. Of these, 112 have been completed at a total cost of more than $13 million, and 39 are continuing at various stages of completion at a total estimated cost of more than $7.5 million.

Alewife and blueback herring:

Connecticut 3-45-R — William Lund, Jr. — Completed 1968 — $42,100

Investigation of the life histories and potential fishery of river herrings - This project, initially funded under P.L. 88-309, has been transferred for funding under P.L. 89-304. See Connecticut AFC-3.

Connecticut AFC-3 — William Lund, Jr. — Completed 1970 — $43,000

Investigation of the life histories and potential fishery of river herrings in Connecticut - Alewife and blueback herring were captured by 500-foot seine in lower Connecticut River, marked with polystyrene dye, and released to observe migratory behavior. Ovarian samples were collected before and after spawning for fecundity studies. Observations were made also on growth and distribution of the young fish in fresh water.

Connecticut AFC-7 — William Lund, Jr. — $16,000

Estimating the number of river herring in the Connecticut River - River herrings (alewife and blueback herring) are captured by pound net in lower Connecticut River, marked, and released to estimate abundance and evaluate the potential for commercial fishery on the species.

Georgia AFC-6 — Walter F. Godwin — Completed 1970 — $47,630

A study of the nursery areas and biology of juvenile anadromous fishes of the Altamaha River, Georgia - The distribution and relative abundance of juvenile anadromous fish, primarily river herrings, in the Altamaha River system were determined. Also, primary and secondary nursery areas were mapped.

Illinois AFC-2 — Harry Cook — Completed 1972 — $33,000

Histology of the thyroid and pituitary glands in the alewife - The thyroid and pituitary glands in alewife were studied on a seasonal basis in an effort to determine whether there are differences in these cells between freshwater and marine fish stocks.

Maine AFC-2 — Frederick T. Baird, Jr. — Completed 1969 — $48,000

Increased development of the commercial anadromous fishery resources of Maine - Published material on the condition and potential for improvement of the State's anadromous fishery resources, especially alewife and blueback herring, was updated through physical reconnaissance and biological field survey on coastal streams.

Maine AFC-14 — C.J. Walton — $35,100

Development and management of alewife, blueback, and shad resources - The overall objective of this study is to develop and manage the alewife and blueback herring resources in Maine's coastal streams. The immediate work is to determine the feasibility of using mechanical or truck-stocking procedures to develop and enhance runs of these fish.

Massachusetts AFC-12 — Charles F. Cole — $11,000

Biological assessment of the alewife population, Parker River, Massachusetts - The purpose of this study is to estimate size, movement, and selected biological parameters of the spawning runs of alewife in the Palmer River, and correlate physical and chemical parameters to timing, size, and numbers of fish passing through the system.

New Jersey AFC-2 — Robert H. Soldwedel — $7,800

Anadromous fish inventory - The objective of this study is to obtain information on spawning areas of river herring and American shad in coastal streams, and on the timing and size of runs of these fish.

Virginia AFC-1 — Jackson Davis — Completed 1970 — $600,165

Biology and utilization of anadromous alosids - Life history, biology, and utilization of alewife and blueback herring were studied in the tidal rivers of Virginia, including the James, York, and Rappahannock, to determine the additional fishing pressure the stocks can withstand without endangering the resource.

Virginia AFC-7 — Jackson Davis — $180,000

Biology and management of river herring and shad - To develop a sound biological basis for management of anadromous fish in a period of increasing multiple use of estuarine spawning grounds and nurseries and increasing exploitation.

Wisconsin AFC-4 — Marcia V. Boyles — Completed 1970 — $14,000

A comparative study of the thyroidal, interrenal, and gonadal activity in alewife - Histological examination was made of thyroid tissue of freshwater alewife to observe seasonal change in activity in the gland. Seasonal variations in interrenal activity and blood serum hormonal concentrations were investigated also.

Wisconsin AFC-5 — Carroll R. Norden — Completed 1970 — $55,930

An investigation of the reproductive cycle of the alewife in Lake Michigan - The growth and maturation of the gonads of alewife collected from Lake Michigan were studied. Histological preparations of the gonads were used to describe and compare developmental stages as they occur in young-of-the-year, age group I, age group II, and older fish.

Wisconsin AFC-6 — A.M. Beeton — Completed 1969 — $30,577

Study of the population dynamics of juvenile alewife and coregonids in Green Bay, Lake Michigan - This project provided for construction and testing of experimental drop nets for determination of distribution and relative abundance of juvenile alewife and coregonids throughout Green Bay of Lake Michigan.

Wisconsin AFC-9 — Jon G. Stanley — Completed 1972 — $35,000

Mucus and osmoregulation in alewife and smelt - Seasonal cycles in mucus cell function in alewife and smelt as related to ancestral patterns of anadromous migration were studied, and the effects of thermal stress upon mucuous cell function and relationship between changes in the productive mucuous coat and osmoregulatory failure as a cause of mass mortality in alewife were determined.

American shad:

Connecticut AFC-1 — William Leggett — Completed 1969 — $43,000

A study of the rate and pattern of shad migration in the Connecticut River utilizing sonic tracking apparatus - Twenty-seven shad were marked with acoustic tags and tracked for varying distances in the Connecticut River to determine their rates and patterns of movement. Tracking emphasis was in the outfall areas of the Connecticut Yankee Atomic Power Company atomic plant at Haddam Neck located in the center of the commercial fishing area. Individual fish were tracked continuously for periods up to 56 hours; contact was reestablished with some fish after initial tracking had been discontinued.

Connecticut AFC-6 — Peter Minta — $17,000

A study of the migratory behavior of American shad - The purpose of this study is to investigate the orientation and migratory behavior of shad in Long Island Sound and at the mouth of the Connecticut River. To study mechanism of orientation, individual fish will be fitted with eye caps, have their nostrils plugged, and/or have their lateral line sensors destroyed, and tracking will be done by electrical tracking gear and dart tags.

Connecticut AFC-8 — W.C. Leggett — $9,000

A study of the weight loss in American shad during the freshwater migration - This study is undertaken by the Essex Marine Laboratory to determine weight loss of adult American shad during freshwater spawning migration in the Connecticut River, and the extent and source of this weight loss from various body parts. Also, an estimate is made of the efficiency of the migration in terms of weight loss.

Delaware AFCS-1 — Charles Lesser — Completed 1968 — $20,000

Feasibility of the restoration of the shad runs in the tributaries of the Delaware estuary - Fertilized shad eggs from the Susquehanna River stock were hatched in boxes placed in Brandywine Creek, tributary to Delaware River, to determine suitability of the stream for shad restoration. This creek originates in Pennsylvania and enters the Delaware at Wilmington.

Florida AFC-2 — Edwin Joyce, Jr. — Completed 1971 — $94,240

Investigations on the American shad in the St. Johns River - Abundance, seasonal migration, spawning activities, and other pertinent biological information were determined for American shad in the St. Johns River. An assessment of the possible effects of silt, pollution, physical disturbances, and fishing pressure was attempted also.

Georgia AFC-1 — Walter F. Godwin — Completed 1968 — $27,570

Shad fishery of the Altamaha River, Georgia - The estimated weight of the shad population entering the Altamaha River, the fishing rate, and age composition of the commercial catch were determined. Factors affecting production were investigated also.

New Jersey AFCS-1 — Ronald White, Jr. — Completed 1968 — $59,500

Population and migration study of major anadromous fish - American shad were captured with gill nets in upper Delaware Bay and lower Delaware River, marked with Peterson disc tags, and released to obtain information on migration and origin of the stocks in the fishery. Most of the recaptures were made outside Delaware Bay and as far north as the St. John River, New Brunswick, Canada.

Oregon 1-38-R — Arthur L. Oakley — Completed 1969 — $12,000

Biology of Columbia River shad and the development of selective commercial fishing gear - Since little was known about shad in the Columbia River and no studies had been made since the early 1950's, this study provided current information on the status of this available resource. Studies of life history and of the reproductive potential and natural mortality of this species were made. Selective commercial fishing gear and methods necessary to allow the salmon to escape were developed.

Oregon AFC-10 Robert Loeffel Completed 1970
$33,600

Shad and striped bass management study - Data needed to manage the shad and striped bass fisheries, such as catch, effort, age and sex composition of the catch, and spawning history, were obtained in Oregon coastal streams. In addition, about 1,000 adult shad in the Umpqua and Smith Rivers were marked with spaghetti tags to obtain information on upstream migration.

Oregon AFC-53 Alan M. McGie Completed 1973
$61,500

Shad and striped bass management study - Catch statistics, fishing intensity, and catch-per-effort data for shad and striped bass were collected on the Siuslaw, Umpqua, Smith, Coos, and Coquille Rivers. Data will be used to estimate size of runs in these rivers.

Pennsylvania AFCS-1 David Daniels Completed 1969
$35,000

Feasibility study of the restoration of shad runs in the tributaries of the Delaware River estuary - Fertilized shad eggs were placed in hatching boxes throughout the Pennsylvania section of Brandywine Creek, tributary to Delaware River, to determine the suitability of the stream for restoration of American shad.

Pennsylvania AFC-4 David Daniels $9,000

Restoration of shad runs in the Brandywine Creek and its tributaries - This is a joint study with the State of Delaware to restore shad runs in Brandywine Creek. Obstructions to upstream movement of fish are being removed, and fertilized shad eggs planted in the stream.

Baitfish:

Alabama 2-83-R Wayne E. Swingle Completed 1970
$3,990

Survey of the live bait-shrimp industry in Alabama - The licensed live bait-shrimp dealers were surveyed to determine the landings from Alabama waters and composition and distribution of these landings.

American Samoa 4-21-D Stanley N. Swerdloff $25,000

Development of natural and captive baitfish stocks - The objectives of this study are to determine relative abundance and seasonal variation of natural bait stocks around Tutuila Island, and to identify and import easily cultured species which have potential as tuna live bait.

Washington 1-81-R Al Millikan Completed 1973
$56,400

Puget Sound baitfish studies - Abundance and distribution of baitfish within Puget Sound were estimated by acoustic gear and survey techniques developed by the University of Washington. The level of effort necessary to monitor the herring stocks was determined also.

Groundfish:

Maryland 3-21-R Ted S.Y. Koo Completed 1967
$26,672

Determination of the distribution and abundance of the winter flounder, Pseudopleuronectes americanus - Adult winter flounder were caught from November through May in deep or channel hauls with trawl throughout Chesapeake Bay and river mouths, except in lower Patuxent River.

Massachusetts 3-38-R Allen Petersen Completed 1969
$32,000

Identification of winter flounder subpopulations - Tagging information is evaluated and experimental otter trawl data are analyzed to define the limits of the winter flounder population along Massachusetts coast.

Massachusetts 3-87-R — Phillip G. Coats — $29,300

Winter flounder investigations - Knowledge of the contributions of estuarine winter flounder to the offshore fishery is needed to effectively manage and regulate this important fishery. Populations of juvenile and subadult flounders will be estimated by mark and recapture methods. Stratified random sampling with an otter trawl and plankton nets will be made in a selected area on Nantucket. Several types of tags for juvenile winter flounder will be evaluated under controlled conditions.

Oregon 1-4-R — Robert L. Demory — Completed 1970 $165,390

Investigation of the abundance and recruitment of bottomfish off Oregon, with emphasis on Dover sole - Data on fluctuations in abundance and year-class strength of Dover, English, and petrale soles and Pacific ocean perch were evaluated. Techniques for determination of spawning success and abundance were investigated also.

Oregon 1-78-D — Robert L. Demory — $83,508

Resource survey of the Continental Shelf off Oregon - A resource survey of the Continental Shelf from the Columbia River south to Cape Blanco is undertaken. The first phase of the study will determine abundance of demersal fish occupying the area. The second phase of the study would survey the potential yield of ocean pink shrimp. The information is needed on these resources to negotiate with foreign nationals about stocks outside the 12-mile zone.

Washington 1-22-R — Gene DiDonato — Completed 1970 $369,080

Monitor condition of certain groundfish stocks, Washington trawl grounds - To obtain information on stock identity and migratory behavior of English sole, Pacific cod, and petrale sole, 5,000 to 10,000 fish of each species were tagged and released and biological data collected. The information obtained will be useful in international fishery negotiations.

Washington 1-70-R — Gene DiDonato — Completed 1971 $137,540

Monitor conditions of certain groundfish stocks, Washington trawl grounds - Information was obtained on the migration patterns and present status of the principal groundfish species captured by the trawl fleet through a port sampling program, tagging cruises, and intensive studies of the fish stocks.

Washington 1-75-R — Gene DiDonato — Completed 1973 $273,528

Trawl fishery monitoring and data analysis - This project is a followup of the work carried out under P.L. 88-309 projects 1-22-R and 1-70-R that gathered information on stocks of groundfish. These data are put on computer-oriented storage and retrieval system to ascertain the status of these fish stocks in the trawl fishery and their maximum sustainable yield.

Mackerel:

Hawaii H-4-R — Henry M. Sakuda — Completed 1969 $25,878

Management investigation of the akule or jack mackerel (Trachurops crumenophthalmus) - About 5,000 young akule were tagged with internal anchor tag and released off the southern coast of Oahu to obtain information on growth and migratory behavior. Commercial akule fishery catch statistics were collected, tabulated, and analyzed to determine trends in abundance.

Pacific salmon:

Alaska 5-4-R — Daniel P. Hennick — Completed 1969 $302,825

Pink salmon forecast research - From 1966 through 1969, abundance of preemergent fry of pink salmon was sampled in about 25 streams in Kodiak area, 12 in Cook Inlet area, and 100 in southeastern Alaska. Based on an abundance index, annual forecasts were made of size of returning adult runs. The optimum escapement for selected streams was also studied.

Alaska 5-5-R — Robert Panlue — Completed 1969 — $130,200

Kvichak River smolt study - Smolt counts were made as indexes for predicting the size of the returning sockeye salmon run and for estimating the optimum for the Kvichak River of Bristol Bay area.

Alaska 5-6-R — Allen Davis — Completed 1969 — $206,000

Cook Inlet sockeye salmon investigation - Research was conducted on annual downstream migration of sockeye salmon smolt, time of migration, and condition of the fish in the Kenai and Kasilof Rivers in an attempt to better understand the carrying capacity of the river system. Information is obtained, also, on spawning grounds, age and sex composition of the catch, and escapement of sockeye salmon to Cook Inlet drainages.

Alaska 5-7-R — Martin F. Eaton — Completed 1967 — $49,400

Investigation of factors limiting the production of introduced sockeye in lakes - Sockeye salmon were introduced into Frazer Lake by installing ladders at obstructions in outlet streams and by planting adult fish and eyed eggs in potential spawning areas of inlet streams. Survival and growth of juveniles were investigated to evaluate factors limiting production in the lake system.

Alaska 5-17-R — Ken Durley — Completed 1971 — $116,500

Pink salmon studies - This study expanded the State's preemergent fry forecast program in the Cook Inlet area for 1 additional year and in the southeastern Alaska area for 2 additional years.

Alaska 5-18-R — Allen Davis — Completed 1971 — $107,700

Sockeye salmon investigations - The magnitude of smolt out-migration from the major sockeye Cook Inlet system and the relationship of this out-migration to the return of the adult were determined. The magnitude and timing of the various stocks of Cook Inlet sockeye salmon were observed also.

Alaska AFC-2 — Lyle Simpson — Completed 1970 — $202,000

Sockeye salmon migration behavior and biological statistics collection, Southeastern Alaska - Weirs were operated at High Smith, Helta, Klawock, Chilkat, and Salmon Bays and at Tahltan, Klakas, and Redfish Lakes to obtain racial and age data on sockeye salmon stocks and to make counts of the escapement. As a result of small catches, tagging studies to obtain information on migratory routes of the marked fish were abandoned after the 1967 season.

Alaska AFC-4 — James L. Mauney — Completed 1970 — $496,000

Offshore salmon abundance index - Gill nets and longline gear were fished 15 to 30 miles offshore between Yakutat Bay and Dixon Entrance to make short-term forecasts of the timing and size of runs of chum, pink, and sockeye salmon as they near the inshore fisheries. The information provided industry with lead time for adjusting plant operations and disposition of the fishing fleet and gives the States data on which to base decisions for management of the runs.

Alaska AFC-6 — Kenneth R. Middleton — Completed 1970 — $218,400

Bristol Bay intermediate high-seas inshore test fishing program - Gill nets were fished between Port Moller and Cape Newenham to sample the sockeye salmon stocks and determine size, time, and age composition of the runs 6 to 8 days before the fish enter the inshore commercial fisheries. The study provided information useful for regulating the runs.

Alaska AFC-7 | Micheal F. Geiger | Completed 1970 $322,800

Arctic-Yukon-Kuskokwim anadromous fish investigations - Tag and recovery projects were conducted in the Arctic-Yukon-Kuskokwim management areas to determine population sizes and escapements, destination, movements, and timing of different stocks of king and chum salmon and sheefish.

Alaska AFC-8 | Roger F. Blackett | Completed 1970 $423,600

Kodiak Island sockeye salmon investigations - Research was continued on the five major Kodiak Island sockeye salmon stocks, which originated in Karluk, Red, Upper Station, Akalura, and Frazer Lakes. The purposes of the studies were to identify stocks, count escapements and smolts, and obtain data on such life history features as timing of runs and age and sex of adults. In addition, adult fish, fry, and eyed eggs were transplanted to tributary streams of Frazer Lake to supplement natural reproduction.

Alaska AFC-9 | Jack Lechner | Completed 1968 $40,000

Identification of red salmon stocks in the Cape Kumlik-Aniakchak Bay fishery (Chignik area) - Information was obtained on the origin of the red salmon stocks harvested by the Cape Kumlik purse seine fishery at Aniakchak Bay.

Alaska AFC-10 | Robert S. Roys | Completed 1970 $295,800

Copper River sockeye salmon investigations - Salmon were tagged and released below and above Wood Canyon to assess escapement. Aerial and ground surveys of spawning areas were made to estimate the escapements and the use of the spawning areas.

Alaska AFC-12 | Richard W. Tyler | Completed 1968 $44,400

Forecast of Kodiak Island pink salmon from abundance of juveniles in estuaries - This project is part of an overall study of the pink salmon runs to the Kodiak area by the Fisheries Research Institute of the University of Washington. Sampling methods currently used in forecasting were tested.

Alaska AFC-13 | Duane E. Phinney | Completed 1968 $33,700

Optimum escapement studies of Chignik sockeye salmon - This project investigated the ecological association of young sockeye salmon and competitor species in two physically and biologically dissimilar lakes in the Chignik River system.

Alaska AFC-14 | Daniel P. Hennick | Completed 1970 $105,400

Pink salmon forecast research - About 15 streams in the Chignik area of the Alaska Peninsula were sampled to obtain an index of the annual production of pink salmon fry.

Alaska AFC-15 | Robert C. Francis | Completed 1969 $36,000

Computer simulation model of the Dixon Entrance salmon stocks - A computer simulation model technique was used in a study of the Canada and United States salmon stocks and fisheries in the Dixon Entrance area of southeastern Alaska and northern British Columbia.

Alaska AFC-16 | Allen Davis | Completed 1970 $132,800

Escapement enumeration investigations - An electric fish counter was used to evaluate and improve counts of salmon escapements in clear-water streams in Bristol Bay and the turbid waters of Kenai and Kasilof Rivers, Cook Inlet. Counts from towers or the air were compared with those made by the electric counter.

Alaska AFC-17 — Robert L. Burgner — Completed 1969 — $33,700

Optimum escapement studies of Chignik sockeye salmon - Objective of this study was to determine the carrying capacity of the spawning areas in the Chignik system for adult salmon and of the lake and lagoon nursery areas for juvenile sockeye salmon. Additionally, the effect of parent escapement of different magnitudes on the success of progeny during lake residency was investigated.

Alaska AFC-20 — FRI Staff — Completed 1970 — $40,000

Studies of juvenile sockeye salmon in Iliamna Lake and Lake Clark - Information was obtained on abundance of sockeye fry and fingerling and sticklebacks to determine the distribution of these fish within the nursery areas and to determine the age, size, and weight of juveniles.

Alaska AFC-21 — Robert Paulus — Completed 1970 — $58,700

Kvichak River smolt study - This study provided total out-migration estimates or comparable annual indices of the age, composition, and number of sockeye salmon smolts leaving the Kvichak River.

Alaska AFC-22 — William Parr — Completed 1970 — $33,700

Optimum escapement studies of Chignik sockeye salmon - Regulation of sockeye salmon escapements to the two lakes in the Chignik system has been sharply modified in recent years as a result of conclusions drawn from intensive studies of past and present conditions in the lake system. Objectives of this study were to determine whether the changes in escapement levels are in fact having the expected and desired effect.

Alaska AFC-24 — James Mauney — Completed 1971 — $107,800

Offshore test fishing - Southeastern Alaska - Offshore fishing was conducted between Yakutat Bay and Dixon Entrance to develop a method for determining abundance of pink salmon shortly before the runs enter the inshore commercial fisheries. Stock identification, timing of runs, and home stream were determined also.

Alaska AFC-25 — Allen Davis — Completed 1971 — $4,000

Sonic assessment of salmon escapements - Sonar units were installed and operated in Bristol Bay, Cook Inlet and Prince William Sound streams to evaluate the counter as a tool for measuring escapement of salmon.

Alaska AFC-26 — Robert C. Lebida — $100,800

Yukon River anadromous fish investigations - Work under this project will make escapement estimates for king and chum salmon runs and observations on size and age.

Alaska AFC-27 — Roger F. Blackett — Completed 1972 — $212,000

Kodiak sockeye rehabilitation - Project aims were to increase the size of the sockeye salmon runs returning to Kodiak Island spawning system by adult transplants or eyed egg and fry plants.

Alaska AFC-28 — Larry Edfelt — $41,200

Alaska Peninsula pink salmon forecast - The objectives of this project are to locate and map the major spawning riffles in the pink salmon streams of the Peninsula.

Alaska AFC-29 Stanley Moberly Completed 1971
$62,800

Sockeye salmon studies - Southeastern Alaska - Collection of biological statistics was continued, and a determination was made of the sockeye salmon producing system in southeastern Alaska, the size of these stocks, and their racial characteristics.

Alaska AFC-31 Robert Paulus $32,200

Bristol Bay test fishing - This project provides an estimate of abundance and time of arrival of sockeye salmon bound for Bristol Bay before they enter the commercial fishery after they have been exposed to the Japanese high-seas fishery. It gives an estimate of the accuracy of forecast and information on size and age composition of the runs 6 to 10 days before they enter the Bristol Bay fishery proper.

Alaska AFC-32 Peter J. Fridgen $99,400

Identification and enumeration of Copper River sockeye salmon stocks - Distribution and magnitude of sockeye salmon escapements are estimated by tag and recovery and by installation of sonar counters on glacial tributaries.

Alaska AFC-33 Robert Paulus Completed 1972
$147,200

Sockeye smolt enumeration study - The Kvichak River produces the world's largest sockeye runs and is the mainstay of the Bristol Bay fishing industry. This project obtained an estimate of smolt production which is basic information on which to make forecasts of returning runs--information which both management and industry use to plan distribution of manpower and money.

Alaska AFC-34 William Parr $33,700

Species interrelationships in Chignik Lakes - Relationship between young sockeye salmon and resident fish species in Chignik Lakes as they compete for limited space and food is investigated.

Alaska AFC-35 Ole A. Mathisen Completed 1971
$50,000

Carrying capacity of the sockeye salmon nursery areas in the Kvichak district, Bristol Bay, Alaska - The production of juvenile sockeye salmon as a function of large escapements in a continuous time sequence was observed.

Alaska AFC-40 Fred Bergander $80,600

Southeastern Alaska sockeye salmon optimum escapement studies - Estimates are made of optimum escapements of sockeye salmon in the Chilkat, Chilkoot, and Situk Rivers for development of management techniques for achieving desired escapement goals. Escapements are enumerated for other southeastern sockeye systems also.

Alaska AFC-41 Allen S. Davis $174,600

Cook Inlet sockeye salmon forecast and optimum escapement studies - Information is obtained on stock size and timing in the catch and escapement for Cook Inlet major sockeye runs. Additionally, magnitude of the smolt migrations from the runs is determined.

Alaska AFC-42 Kenneth Durley $121,400

Alevin abundance - pink salmon prediction studies - The accuracy and quality of forecasts of returning pink salmon runs to southeastern Alaska streams are improved by placing increased emphasis on escapement enumeration, timing of runs, and distribution of spawners within streams. The feasibility of chum salmon forecast is investigated also.

Alaska AFC-43 — Lance L. Trasky — $22,000

Norton Sound anadromous fish investigation - The objectives of this study are to develop indices of the magnitude of Norton Sound salmon escapements, determine magnitude and effect of local commercial and subsistence harvest on the stocks, and determine distribution and origin of salmon in the Unalakleet commercial fishing area.

Alaska AFC-44 — Douglas Eggers — $6,000

Systems modeling of sockeye salmon in the Wood River Lakes - A systems modeling approach is undertaken to study long-range behavior of sockeye salmon as relates to escapement-return relationship. The research is being done by University of Washington.

California AFC-8 — Richard Hallock — Completed 1968 $72,000

Delta migration study - Behavior pattern of adult king salmon as influenced by stream flow and other selected physical factors was observed by electronic tracking during the movements of the fish through the San Joaquin River Delta.

California AFC-12 — Patrick O'Brien — $89,800

Ocean salmon study - This study is undertaken to investigate ways and means of increasing the ocean salmon catch and to evaluate effects of management programs on the ocean salmon fisheries. Initially, information would be obtained on migration routes of salmon into and out of the fisheries, distribution of sublegal fish, and hooking mortality of sublegal salmon.

Indiana 4-43-R — James J. Barry — Completed 1971 $36,000

Interspecies relationships of fish in Indiana waters of Lake Michigan - This project was designed to determine how long salmon inhabit the Indiana waters of Lake Michigan and to determine their behavioral pattern with other fish species. Collections of fish were made with gill nets and trawls, and fish were inspected aboard commercial vessels.

Oregon AFC-18 — Wallace Hublou — Completed 1970 $856,400

Development and improvement of hatchery techniques for Pacific salmon and steelhead trout - Research was undertaken to improve the nutritional qualities and physical characteristics of pellets used to feed Pacific salmon and to develop methods for fish disease prevention, detection, and control in hatcheries. The work was done at the Fish Commission's laboratory at Clackamas and at Oregon State University.

Oregon AFC-19 — Robert Loeffel — Completed 1970 $134,400

Management of the troll salmon fishery with emphasis on the collection of data on shore and at sea for regulation formulation - The use of barbless hooks as a management tool in the troll salmon fishery and the radionuclide Zn^{65} as an identification mark of Oregon-Washington coho salmon when mixed with salmon from other areas was investigated.

Oregon AFC-21 — Ernest R. Jefferies — Completed 1968 $48,200

Increased production of anadromous salmonids in Oregon coastal streams and lakes - Coastal streams and lakes were surveyed to locate potential sources of hatchery water and salmon spawning and nursery areas, and to map barriers to fish migration.

Oregon AFC-26 — Robert Loeffel — Completed 1969 $100,000

Research and management on wild and hatchery-produced salmon and steelhead in Oregon south coastal streams - The status of Elk River fall chinook salmon stocks was studied to determine the effects of hatchery-produced fish on natural stocks. Coincident and similar studies were made on the adjacent Sixes River, which was the experimental control.

Oregon AFC-39 | Robert Loeffel | Completed 1970 $173,600

Salmon investigations on the Northern Oregon Coast - Results of hauling hatchery-produced adult and fry coho salmon to barren coastal streams and lakes and the planting of coho smolts into nonhatchery streams were evaluated.

Oregon AFC-50 | Kirk Beininger | Completed 1973 $838,738

Improvement of salmon and steelhead trout hatchery techniques - The project provided for research on the biology of hatchery-reared salmon and steelhead trout and for studies for improvement of hatchery procedures and techniques.

Oregon AFC-52 | Robert Loeffel | Completed 1973 $157,200

Management of the troll salmon fishery - This project was essentially a continuation and expansion of the State's ocean salmon fishery research program. Objectives were to compile catch statistics and mark recovery information, follow trends in fishing effort, evaluate the catch, and make final analysis of all data collected to date.

Oregon AFC-54 | Wallace Hublon | Completed 1973 $557,000

Salmon research on coastal streams and reservoirs - This project was undertaken to obtain life history and ecological information for use in programming hatchery operations, predicting and controlling adverse effects of environmental alterations, investigating unused potential of coastal lakes and reservoirs, and measuring the status of coastal stocks of salmon.

Washington 1-18-R | Harry Senn | Completed 1969 $14,000

Investigation of effects of Grays Harbor waters on coho emigration - Marked yearling coho salmon were released in drainages of Grays Harbor to determine the differential in harvest between the river systems. Marked coho were released, also, above and below suspected environmental "blocks" in the Grays Harbor Estuary to measure how the blocks affect fish emigration through such areas.

Washington 1-29-R | Ray C. Johnson | Completed 1967 $16,000

Early marine life history - chum and pink salmon - Visual observations, beach seine, and traps were used to obtain information on distribution and abundance of pink and chum salmon fry in Puget Sound estuaries. A technique for mass marking of salmon fry with fluorescent dyes was investigated.

Washington 1-30-R | Earle D. Jewell | Completed 1968 $36,600

Field recovery coded wire tag - This study has improved magnetic detectors for recovery of coho salmon marked by coded wire tag and development tools and techniques to improve tag extraction. Field recovery tests have been conducted over a broad range of conditions in Puget Sound.

Washington 1-32-R | Harry Senn | Completed 1971 $92,500

Hatchery coho salmon--contribution to the fishery - As part of a hatchery evaluation program the Washington Department of Fisheries released fin-clipped smolt coho salmon at 22 hatcheries on tributaries to Puget Sound and Columbia River. Stations participating in the evaluation program marked about 10 percent of their yearling production. Marked adult fish were recaptured at the hatchery racks by the hatchery personnel.

Washington 1-33-D | Richard E. Noble | Completed 1970 $171,000

Evaluation of dry feed for hatchery salmon - Dry fish feeds formulated from raw materials, including nonfood fish and kelp, as well as byproducts from milling and other food production, were tested and evaluated for hatchery-reared salmon.

Washington 1-37-R | Peter K. Bergman | Completed 1968 $44,000

Analysis and publication of coded wire tag research data - Data on retention of coded wire fish tags were processed, and the information placed on data processing cards. Analyses were performed on most aspects of the study.

Washington 1-40-R | Ray C. Johnson | Completed 1969 $64,000

Larval and estuarial studies - pink and chum salmon populations - Egg and preemergent fry were sampled in Puget Sound streams and rivers to assess survival of chum salmon alevins to the swim-up stage. Density and abundance of the fry provided information for the prediction of the size of adult run.

Washington 1-54-R | Ray C. Johnson | Completed 1971 $38,000

Pink and chum salmon prediction studies - The purpose of this study was to obtain juvenile survival and abundance data to permit adequate testing of experimental techniques used to predict returns of adult pink and chum salmon. The relationship of environmental data of past years to corresponding chum salmon runs size for the purpose of prediction was evaluated.

Washington 1-55-R | Samuel G. Wright | Transferred to P.L. 89-304

Ocean salmon fisheries sampling - A comprehensive sampling program involving both permanent and temporary samplers at major coastal landing ports was established to monitor pertinent biological factors of Washington ocean salmon fisheries. Sampling included both fish landed at dockside and onboard observations during actual fishing operations.

Washington 1-72-D | Kenneth Kral | Completed 1971 $45,200

Capital Lake fall chinook rearing program - The means of attaining the maximum fall chinook production and resultant contribution to the fishery from Capital Lake were determined. Natural rearing in the lake and artificial feeding were evaluated also.

Washington 1-73-D | R.E. Noble | Completed 1971 $45,000

Hatchery dry feed field tests - This project provided for field tests of dry diets for salmon commercially prepared by different manufacturers to determine feeding parameters tested with the Oregon pellet production diet control. After 1 year the project was transferred to P.L. 89-304 (See AFC-58)

Washington AFC-12 | Earle D. Jewell | Completed 1968 $18,500

Port Susan-Port Gardner pink salmon studies - During August and September 1967, 3,201 pink salmon were marked with Peterson disc tags and released in the Puget Sound (Port Susan-Port Gardner) commercial fishery near Everett. Tags from 657 recaptures were returned. Returns are analyzed to provide information on the origin, timing, and movement of the marked fish.

Washington AFC-13 | Ernest Salo | Completed 1970 $306,022

Measurement of spawning success and fry quality of chum salmon utilizing natural and controlled spawning areas in Big Beef Creek, Washington - A spawning channel was developed by modifying a small stream located at the University of Washington's Fisheries Research Institute station on Big Beef Creek about 2.5 miles north of Seabeck on Hood Canal in Kitsap County. It provided controlled conditions for studies of the survival rate and quality of salmon from egg deposition to emergence in areas where the ecological conditions of the spawning beds have been manipulated.

Washington AFC-14 — Earle D. Jewell — Completed 1970 — $45,100

Gill net dropout study - Objectives of the original project were, first, to determine the rate of salmon dropout for gill nets of various size mesh and survival of salmon that escape gill nets, and, second, to develop a net to reduce such dropout. Only the first objective was accomplished for chinook and coho salmon in the Puget Sound fishery.

Washington AFC-35 — Frank Haw — Completed 1970 — $24,000

Puget Sound resident coho study - The purpose of this study was to develop practical methods of artificially enhancing the population of coho salmon that historically has resided within Puget Sound (resident) and had thus contributed heavily to the local recreational fishery.

Washington AFC-46 — Frank Haw — Completed 1973 — $82,240

Puget Sound resident coho study - The purpose of this study was to build up the resident coho salmon stocks in Puget Sound by artificially rearing wild strains of fish that have historically resided within the Sound.

Washington AFC-47 — Harry Senn — Completed 1970 — $8,032

Fall chinook contribution to the fishery - The contribution to the fishery, made by fall chinook salmon from the Skagit River hatchery, was measured through the use of marked fish released from 1969 brood year fingerlings.

Washington AFC-50 — Ernest O. Salo — Completed 1973 — $355,590

Big Beef Creek chum salmon spawning success and fry quality - This project was essentially a continuation of the recently completed project AFC-13 to determine optimum spawning and hatching conditions for chum salmon by use of artificial spawning channels.

Washington AFC-55 — Samuel G. Wright — $69,622

Washington ocean salmon fisheries biological sampling program - The objective of this project is to monitor the commercial and sport salmon fisheries operating from Washington coastal ports for biological and statistical data. This will provide up-to-date information on progress of the fisheries and the primary basis for regulation and management of the resources. The project is a continuation of work carried out as project 1-55-R under P.L. 88-309.

Washington AFC-56 — Earle D. Jewell — Completed 1972 — $13,524

1971 Lake Washington sockeye tagging study - Adult Lake Washington sockeye salmon passing through Puget Sound between Discovery Bay and the Ballard Locks were investigated through tag and recovery program. Information was obtained on migration route and rate, marine gill net harvest, and timing of different spawning populations.

Washington AFC-57 — Earle D. Jewell — Completed 1972 — $10,498

Puget Sound fall chinook tagging study - This tag and recapture study determined the time of appearance and distribution of the spawning stocks of various hatchery and nonhatchery fall chinook stocks in the fishing area from Discovery Bay to Seattle. Harvest rates by the sport and commercial fisheries were estimated also. This information is needed to develop a rational management and regulation program for the fisheries.

Washington AFC-58 — R.T. Noble — Completed 1972 — $21,000

Hatchery dry feel field tests - The project continued research initiated under P.L. 88-309 as project number 1-33-D to evaluate commercially prepared diets for hatchery-reared salmon. Advantages of using dry diets in straight and circular raceways were evaluated.

Washington AFC-61 — Peter K. Bergman — Completed 1973 — $244,000

Hatchery chinook contribution to the fisheries - Objectives were to evaluate the effectiveness of hatchery chinook rearing procedures in terms of fishery contribution and to evaluate certain untried procedures to increase hatchery-produced fish to Puget Sound sport fishery.

Washington AFC-62 Ray C. Johnson $20,000

Prediction studies, pink and chum salmon - To predict run sizes for Puget Sound pink and chum salmon, based upon the relationship of samples and observed abundance during early life history phases to subsequent adult returns.

Wisconsin AFC-11 R.C. Lindsay $24,866

Evaluation of food processing methods for Great Lakes anadromous fish - This project is for the development of potentially valuable commercial fishery resources through improved quality of Great Lakes salmon and for obtaining information on the chemical composition of raw and processed fish, as well as pesticide residues in fish flesh portions. The research is being done at the Department of Food Science, University of Wisconsin.

Scup:

Rhode Island 3-138-R Richard T. Sisson $13,500

Growth and movement of scup (Stenotomus chrysops) - To obtain information on movement and migratory behavior of scup marked and released in Narragansett Bay. These data will be correlated with other State programs on this species.

Sea bass:

South Carolina 2-138-R Charles M. Bearden $6,800

A study on the black sea bass (Centropristes striatus) - Information on the black sea bass, including description of the fishery and biology and general life history of the species, which is essential for development of management procedures of the resources, is obtained.

Smelt:

Wisconsin AFC-10 C.R. Norden Completed 1971
$7,874

Age, growth, and maturity of the smelt in Lake Michigan - The age, growth, and maturity of smelt populations along the Wisconsin shore were investigated to determine whether or not there are geographical differences in the growth rates.

Wisconsin AFC-12 C.R. Norden $20,800

American smelt and associated species interrelationships in Lake Michigan - This study is undertaken to determine the distribution, food habits, and feeding behavior of smelt and associated species in Lake Michigan adjacent to Milwaukee, Wisconsin. The research will be carried out by the University of Wisconsin - Milwaukee.

Snapper:

Virgin Islands 2-192-R Joseph R. Sylvester $24,330

Selective life history study of silk and blackfin snapper - The objective of this study is to obtain information on fecundity, growth, sex ratio, and food habits of silk and blackfin snapper--the most abundant species caught in the offshore fisheries.

Steelhead trout:

Idaho 1-1-D Terry Holubetz Completed 1970
$62,688

Experimental rearing of steelhead trout at Hayden Creek ponds, Idaho - To determine maximum stocking density for ponds under varied conditions, smolts from eggs of the spring mid-Snake River steelhead trout runs were stocked at rate of 132,000 and 240,000 per acre and reared over a 1-year period at the Hayden Creek ponds. Additional research was made on production of chinook salmon at the same facility.

Striped bass:

Alabama AFC-1 — E. Wayne Shell — Completed 1970 — $69,640

Research on striped bass in Alabama rivers - Methods of culturing fingerling striped bass for mass stocking at minimum costs were investigated at Auburn University. Fingerlings were reared on pelleted trout food and forage minnows in earthern ponds and metal troughs. About 575 of the hatchery-produced fingerlings were marked with spaghetti tags and by fin clips and released in Mobile Bay and Alabama River to study survival, growth, and migration.

Alabama AFC-3 — Madison R. Powell — Completed 1973 — $79,600

Striped bass, Roccus saxatilis, production to establish commercial stocks in Alabama estuaries - Objective of this work was to culture striped bass fry and fingerlings in ponds and cages from 6 to 9 inches long in fresh and brackish water habitat for release into Mobile Bay and contributory streams in an attempt to rehabilitate runs of fish. Results of the stocking of fish were evaluated also.

Alabama AFC-4,7 — E. Wayne Shell — $18,000

Factors limiting the survival and growth of early life history stages of the striped bass (Roccus saxatilis) - The objective of this project is to determine factors that limit the hatchability and survival of eggs and the survival and growth of fry and fingerling striped bass under culture conditions. The work is conducted at Auburn University.

Alabama AFCS-6 — Madison R. Powell — $30,000

Striped bass production and stocking experiments in Alabama coastal areas - Hatchery-produced striped bass fry are reared to fingerlings for experimental stocking in coastal streams and for culture in cages in brackish water. Also, experiments are conducted to determine maximum stocking densities in cages and tag loss and fouling characteristics of two types of tags affixed to fish released in coastal streams.

Maryland 3-27-R — Ted S.Y. Koo — Completed 1968 — $36,595

Tagging of juvenile striped bass, Roccus saxatilis (Walbaum), in Chesapeake Bay estuaries - Aquarium tests were made on the suitability of Carlin, dart, and straight wire tags for marking young-of-the-year striped bass. Several thousand juvenile striped bass were marked and released in upper Chesapeake Bay, C&D Canal, and Patuxent River to study migratory behavior and homing tendency.

Mississippi AFCS-1 — Gorden Gunter — Completed 1970 — $196,600

A study of striped bass, Roccus saxatilis, in Mississippi waters - Experimental stocking of hatchery-produced fingerling striped bass was undertaken in the Pascagoula, Biloxi Bay, St. Louis, and Pearl River systems to determine whether runs can be established in these waters. Some of the released fish were marked with spaghetti tags to obtain life history information.

Mississippi AFCS-4 — Thomas D. McIlwain — $70,000

Establishment of a commercial and sport striped bass fishery in coastal streams, estuaries, and open Gulf of Mexico waters - To establish populations of striped bass in Mississippi waters, advanced fingerlings are stocked in coastal streams.

New York AFC-8 — Byron Young — $48,000

A study of striped bass in the marine district of New York - The purpose of this study is to determine the contribution of the Hudson River stocks of striped bass to coastal fisheries, rate of exploitation by sport and commercial fisheries in Long Island Sound, and to collate information relative to commercial landings with that gathered on sport fishery.

North Carolina AFC-1 William W. Hassler Completed 1970
$60,000

The status, abundance, and exploitation of striped bass in the Roanoke River and Albemarle Sound, and the spawning of striped bass in the Tar River, North Carolina - About 600 striped bass were tagged and released in lower Roanoke River during the spawning season to estimate population size from catch returns. In addition, egg sampling stations were studied on the Roanoke and Tar Rivers to obtain information on the time, duration, and extent of striped bass spawning in each stream.

North Carolina AFC-4 William D. Davies Completed 1970
$39,504

Factors affecting survival of immature striped bass - Fry and fingerling striped bass reared in hatchery ponds fed primarily on Cyclops; therefore, the effects of certain chemicals and environmental factors on zooplankton abundance were investigated. Additionally, the limits of water temperature, pH, and total dissolved solids at which immature striped bass survive were studied.

Sturgeon:

Iowa 2-156-R James Mayhew $10,000

Shovelnose sturgeon investigations - This study is made to obtain information on the status of shovelnose sturgeon in the Mississippi River bordering Iowa--Pools 13 and 18--and on the life history of the species. The information would be used for development of a management and regulation program for this resource.

New York AFC-4 Tom Jollef Completed 1970
$80,000

Evaluation of present and potential sturgeon fisheries of the St. Lawrence and adjacent waters - Condition, utilization, and potential of the sturgeon fisheries of the St. Lawrence River within New York and in the eastern basin of Lake Ontario were investigated. Also, information was obtained on nursery and spawning areas.

South Carolina AFC-1 John G. Leland Completed 1968
$5,340

Survey of sturgeon fishery of South Carolina - Information was gathered on the freshwater life history of the sturgeon, and an inventory was made of the fisheries in coastal streams and Wyanah Bay.

Tuna:

American Samoa 4-22-D Stanley N. Swerdloff $125,000

Further studies of the nearshore tuna resources - This project will investigate the distribution and variations in abundance of skipjack and yellowfin tuna in the nearshore waters of the Island, principally Tutuila Island. Also, studies on effectiveness of various pole-and-line techniques in harvesting these species are continued.

Others:

Alabama 2-120-R Hugh A. Swingle Completed 1973
$50,000

Distribution of commercial fisheries and invertebrates in the tidal rivers of Alabama - This project provided for investigation of the distribution of early life history stages of commercial fishes and abundance and distribution of marsh clams in tidal rivers of Baldwin and Mobile Counties.

California 6-3-R K.F. Mais $126,300

Fisheries resources sea survey - This study is undertaken to determine the total pelagic and bathy-pelagic fishery resources available off the coast of California, and to determine their abundance, degree of utilization, and potential for use.

California 6-7,16-R — Diane Robbins — Completed 1971 — $143,300

Food habits study of organisms of the California current system - The food habits and requirements of fishes and cephalopods that inhabit the California current system adjacent to the coast were investigated. Stomachs of albacore, bonito, hake, rockfish, and squid were collected for analysis.

Florida AFCS-5 — Roy Williams — $81,500

Study of anadromous fishes in Florida - This project will survey about 31 river systems to identify the anadromous fish stocks in each river; obtain basic information on the abundance, seasonal occurrence, and potential level of exploitation; and, based on these data, develop a management plan for the resources.

Georgia 2-32-R — Charles W. Frisbie — Completed 1966 — $3,570

Preliminary survey of existing and potential marine resources on the Georgia coast - The diversity of Georgia's marine finfish and shellfish resources was examined, research needs identified, and project proposals for conservation and development of commercial fisheries developed.

Louisiana 2-94-R — Fred Dunham — Completed 1972 — $86,000

A study of commercially important estuarine-dependent industrial fishes - Industrial fish populations of coastal Louisiana were investigated to provide information for more effective management and to provide industry with information on how to best utilize these resources.

Maine 3-15-R — Frank W. Ricker — Completed 1970 — $81,914

The development of commercial fisheries estuarine resources - An inventory of marine plants and animals having potential for development of commercial fisheries in estuarine and inshore waters was completed. Availability, abundance, and growth of Irish moss were investigated also.

Mississippi 2-128-R — J.Y. Christmas — $20,000

Investigations of coastal pelagic fishes - Seasonal and areal distribution and relative abundance of the larvae, juveniles, and adult pelagic fish species are determined along the coast out to the 50-fathom curve between Mobile Bay and Chandeleur Island. Information is obtained on life history of the species present.

New Jersey 3-2-R — Ronald L. White — Completed 1968 — $38,002

Evaluation of the menhaden and shad fishery in Delaware Bay and adjacent waters - The purpose of this study was to determine whether food fish are taken by the menhaden fishery, if nets damage oyster bottom, whether a "lift period" regulation is desirable for the shad fishery, and if the menhaden fishery attracts sharks.

New Jersey 3-78-R — Paul Hamer — Completed 1970 — $72,000

Inventory of major estuarine systems - Spawning, nursery, and harvest areas of the important fish species were evaluated, and a study was made of the effects of the chemical and physical attributes of the estuaries on the abundance and distribution of these fish stocks.

North Carolina 2-95-R — Maury Wolff — Completed 1971 — $78,840

Scrap fish studies - The effects of commercially harvesting the young of important food fish on future availability of adults of the same species were investigated.

North Carolina AFCS-8 — Michael W. Street — $100,000

Anadromous fisheries research program, northern coastal region - The anadromous fish stocks of Albemarle Sound and the Outer Banks from Cape Lookout to the Virginia line are surveyed to determine spawning and nursery areas, and growth and migratory behavior. Additionally, information on migratory path and composition of the stocks as they enter and leave the spawning areas would be obtained. Offshore work would include observations of foreign fishing vessels to determine the species caught.

Oregon 1-46-R — James Meehan — Completed 1970 — $76,800

Boat charter - A 55-foot trawler was chartered on an annual basis for research on the tunas from northern Oregon coast to Cape Mendocino, California, and on shrimp and crabs in the coastal waters between Astoria and Newport. Albacore were tagged and released for migration studies.

South Carolina 2-110-R — Charles M. Bearden — Completed 1971 — $11,810

An investigation of the offshore demersal fish resources of South Carolina - Project objectives were to accumulate and evaluate information on the species composition, distribution, availability, and potentials of demersal fish populations of economic significance on the Continental Shelf area off South Carolina.

South Carolina AFC-4 — William Wade — $45,000

Commercial anadromous fishery - Edisto River, South Carolina - A general inventory is made of the commercial anadromous fish resources of the Edisto, Savannah, Pee Dee, and Waccamaw Rivers.

Texas 2-47-R — Henry W. Compton, Jr. — Completed 1970 — $199,050

Northwestern Gulf of Mexico marine fisheries investigations - This project determined the abundance and seasonal and size distributions of shrimp in shallow waters of the Continental Shelf and of shrimp and industrial fish in depths beyond 60 fathoms off the Texas coast. Also, the life histories of red snapper and related reef fisheries were studied.

Texas 2-109-R — C.E. Bryan — Completed 1973 — $285,772

Northwestern Gulf of Mexico marine fisheries investigations - study #2 - This work was undertaken to determine the seasonal location, population and size composition, and abundance of the commercial species of reef and mid-water fish and of the commercial shrimp as related to environmental conditions in the northwestern Gulf of Mexico.

Virginia 3-5-D — Jackson Davis — Completed 1970 — $310,731

Investigation of potential for expansion of the industrial fishery of the mid-Atlantic Bight - The spatial and seasonal distribution and abundance of fish of shelf waters between Cape May, N.J., and Cape Hatteras, N.C., were determined to ascertain if any fish are sufficiently abundant to support an industrial fishery.

Wisconsin 4-58-R — Ronald Poff — Completed 1972 — $75,700

Lakes Michigan and Superior assessment studies - Accumulated data on lake trout and associated species are assembled, compiled, and analyzed as a basis for management of the fishery stocks in Lakes Michigan and Superior.

JELLYFISH

Twelve projects have been funded in 7 States and Puerto Rico. All the projects have been completed at a total cost (both State and Federal) of about $1.8 million. Federal share of project cost was 50 percent. Research emphasis was on biological and natural predator control for certain life stages of jellyfish and on development of physical barriers from recreational areas. Also, work was being done on development of means for control of algae that are menacing the oyster industry in Long Island Sound. The program has been temporarily terminated.

Connecticut JF-3-6 — J.S. Ramus — Completed 1973 — $49,126

Studies directed toward methods for control of Codium fragile in Long Island Sound - Laboratory and field studies were conducted to determine Codium's salinity and temperature tolerances, means of growth and reproduction, time of reproduction, invasion patterns, and nature of attachment to oysters.

Florida JF-2-2 — Frank Kennedy — Completed 1972 — $165,520

Survey of the distribution and abundance of the Portuguese Man-O-War in waters adjacent to Florida - This study was designed to obtain basic distribution and abundance data on the Portuguese Man-O-War. Aerial surveys were made monthly to chart direction and movement of this species in relation to the surface water currents and to make abundance estimates. Life history information was also obtained from specimens collected during vessel operations.

Maryland JF-3-1 — David G. Cargo — Completed 1970 — $200,000

A study of the biology of sea nettles to develop potential methods for control of their abundance - The Chesapeake Bay Biological Laboratory conducted studies to obtain a thorough knowledge of the life history of the sea nettle, determine its relation to various environmental factors, determine the effect of this and related species on other Bay animals, and to develop methods of control.

Maryland JF-3-7 — David G. Cargo — Completed 1973 — $284,000

A study of the biology of sea nettles to develop potential methods for control of their abundance - This study was undertaken to increase our understanding of the ecology of the summer sea nettles and to evaluate means of biological, chemical, or physical control of their abundance.

Mississippi JF-2-1 — Philip Phillips — Completed 1971 — $164,162

Population studies of Mississippi Sound and inshore Gulf coelenterates with special emphasis on noxious planktonic forms - This project investigated the life history and related environmental factors relative to population abundance of the noxious coelenterates. The Gulf Coast Research Laboratory, Ocean Springs, analyzed biological samples and hydrographic data collected from the estuaries to the shallow offshore islands.

Mississippi JF-2-8 — James M. Rosato — Completed 1973 — $76,000

Population studies of noxious coelenterates of Mississippi Sound - This study expanded project JF-2-1 and initiated laboratory research on the various species to gain a better understanding of the biology of these animals.

New York JF-3-3 — Kenneth L. Koetzner — Completed 1971 — $50,250

A study of the overwintering and germinating stages of floating marine algae in Great South Bay, New York - The purpose of this project was to find out how to control the abundance of marine algae. Samples of the upper portion of the sediment layer and overlying water were made and analyzed in the laboratory. Changes in temperature and salinity at selected stations were recorded. Overwintering stages collected from October to April were germinated in the laboratory to determine species and growth.

New York JF-3-5 — Kenneth L. Koetzner — Completed 1973 — $88,000

A study of the setting, attachment, and growth of Codium fragile on shellfish in Long Island waters - The purpose of this study was to determine the type of attachment of Codium fragile to shellfish and to determine the factors affecting the production of these juvenile stages and the factors affecting their rate and mode of attachment.

North Carolina JF-2-9 — A.F. Chestnut — Completed 1972 — $42,500

Survey of the distribution, abundance, species composition, and economic importance of noxious coelenterates - Biological information was obtained on the noxious coelenterates in Albemarle, Pamlico, Core, New River, and Cape Fear regions.

Puerto Rico JF-2-6 — Charles Cutress — Completed 1971 — $91,810

Investigation of the biology and control of noxious coelenterates occurring in the coastal waters of Puerto Rico - Little is known of the noxious marine animals in Puerto Rico. A survey was made to determine the type, incidence, and severity of injury to bathers and the occurrence and distribution of noxious marine invertebrates.

Virginia JF-3-2 Dexter Haven Completed 1971
$377,560

An ecological study of the jellyfish (Chrysaora quinquecirrha) - Research activities were conducted in the lower Chesapeake Bay and the James, York, and Rappahannock Rivers to define the distribution and abundance of various life stages of the jellyfish. Possible predators and other causes of mortality associated with the jellyfish were investigated. The work was done at the Virginia Institute of Marine Science, Gloucester Point.

Virginia JF-3-9 Paul Zubkoff Completed 1973
$240,000

Control measures for Chesapeake Bay jellyfishes - This project was a continuation of research on the biology and life stages of jellyfish and will explore control means by inhibiting one of the several life stages. Also, the work attempted to clarify the ecological role of jellyfish and assess the consequences of any promising control measure.

MARINE WORMS

Two projects have been funded, both with Maine's Department of Sea & Shore Fisheries, to obtain information to aid in management of this valuable marine resource and to investigate industry-related mortalities in handling of the worms. One project has been completed at a total cost of $234,000, and one is continuing at an estimated total cost of $117,000.

Maine 3-16-R Edwin P. Creaser Completed 1971
$234,000

Biological, environmental, and technological research on marine worms - Biological studies were conducted on life history, growth, and mortality rates, and predation and distribution of commercial marine worms (bloodworms and sandworms) and other annelid species of potential commercial use. Development of improved methods of harvesting, handling, and shipping was investigated also.

Maine 3-158-R Edwin P. Creaser $38,000

Marine worm research - Catch statistics are collected on the marine worm fishery, and industry-related mortalities in handling of the worms are investigated. Research findings from project 3-16-R are distributed to industry.

SHELLFISH

Ninety-one projects have been funded at a total cost of about $10 million with emphasis on oyster and shrimp research. Of the projects funded, 74 have been completed at a total cost of about $7.3 million, and 17 are continuing at various stages of completion at an estimated total cost of about $2.6 million.

Clam:

Delaware 3-135-R Don Maurer Completed 1973
$60,000

Hard clam survey of Delaware Bay - Work was conducted by University of Delaware Marine Laboratory to determine distribution, abundance, and condition of hard clams in Delaware Bay. Also, the identity and quantities of invertebrate shellfish predators and fouling organisms were investigated.

Florida 2-134-R Mark Godcharles Completed 1972
$118,100

Exploratory clam survey of estuarine and nearshore waters - The purpose was to survey existing clam populations with the R/V Venus, 68-foot Chesapeake Bay softshell clam dredge, as the main sampling device in the estuaries and to characterize and delimit those with commercial potential.

Georgia 2-44-R Walter Godwin Completed 1968
$38,850

Survey of a potential hard clam fishery - A survey along the Georgia coast to determine whether a hard clam fishery is feasible has been completed. Several types of harvesting techniques were tested.

Illinois 4-13-R — William C. Starrett — Completed 1968 — $16,300

Clam industry in Illinois - The Department of Conservation has completed a study to formulate a sound basis for managing the mussel industry. The work involved an inventory of the clam fisheries on the Illinois, Mississippi, and Wabash Rivers.

Louisiana 2-91-R — Johnnie W. Tarver — Completed 1972 — $107,000

A study of the clam, Rangia cuneata, in Lake Pontchartrain and Lake Maurepas, Louisiana - The purpose of this study was to determine the clam shell stocks and rate of replenishment of the clam shells harvested and the factors affecting the distribution, growth, and density of the clam in Lakes Pontchartrain and Maurepas.

New Hampshire 3-31-R — William Ayer — Completed 1969 — $12,000

Soft-shell clam population study in Hampton-Seabrook Harbor, New Hampshire - The feasibility of limited commercial use of the soft-shell clam was investigated through studies of seeding, growth, and mortality in Hampton-Seabrook Harbor.

New York 3-11-D — Gerald Strobel and James Redman — Completed 1966 — $39,000

Pilot plant depuration of hard clams - A pilot plant to determine whether it is feasible to purify hard clams from moderately polluted waters of Long Island Sound has been built. Evaluations were made of various factors. These factors were salinity, turbidity, temperature flow rate, recirculation, and dissolved oxygen, which affect the depuration process for the hard clam.

New York 3-68-D — Quentin R. Bennett — Completed 1968 — $101,000

Studies of problems involved when hard clams (Mercenaria mercenaria) in commercial quantities are subjected to the depuration process - A study of the economic feasibility of the depuration process for hard-shell clams from moderately polluted areas on Long Island Sound has been completed.

Oregon 1-27-R — Paul Reed — Completed 1970 — $62,930

Laboratory hatching and rearing of Pacific coast clams and oysters - The development of methods to spawn and rear several species of clams and oysters for planting was the major objective of this study. Growth was observed from spat grown in the laboratory to placement in Netarts and Yaquina Bays.

Virginia 3-77-R — Dexter Haven — Completed 1970 — $131,200

A study of the soft and hard clam resources of Virginia - The intent of this research was to evaluate the potential of establishing a soft-shell clam fishery in lower Chesapeake Bay and in the James, York, and Rappahannock Rivers. Studies were made with a hydraulic soft-shell clam dredge to determine distribution and abundance, the rate at which the dredged areas would repopulate, and the effect of dredging on the substrate.

Washington 1-42-D — Ronald Westley — Completed 1971 — $125,405

Subtidal hard-shell clam fisheries investigations - Underwater surveys were made to investigate the presence of clams in Puget Sound and the Strait of Juan de Fuca. Commercial quantities have been found in about half of the 41 acres surveyed. Industry, the National Marine Fisheries Service, and the State are cooperating in the development of an efficient harvesting method.

Washington 1-79-D — C. Lynn Goodwin — $40,000

Subtidal clam investigation - This project will complete a study on the life history of geoduck and on the effects of harvest on the stocks. Additionally, a study of the effects of dredging on hard-shell clam and the environment will be made.

Crabs:

Alaska 5-11-R — John C. McMullen — Completed 1969 — $181,300

Reproduction of king crabs (Paralithodes camtschatica) in the Kodiak Island area - Spawning areas of king crab, both offshore and inshore of Kodiak Island, were delineated. Additionally, size of sexual maturity of male crabs from various areas, and other life history and biological characteristics of both larval and adult crabs were observed.

Alaska 5-21-R — Carl W. Lehman — Completed 1970 — $309,500

Dungeness crab research - This study was undertaken to provide knowledge on the biology and life history of the southeastern Alaska Dungeness crab populations for the proper management of this increasingly exploited species. Also, a tag and recovery project was conducted in Duncan Canal near Petersburg to observe growth per molt and migratory behavior of Dungeness crab. Size at sexual maturity was investigated. Also, SCUBA gear was used to observe the effect that log rafting areas have on crab populations.

Alaska 5-22,30-R — Nathan P. Johnson — $49,100

King crab study - This study is on king crab stocks in the Kodiak area. The relative age class abundance of crabs with particular emphasis on annual recruitment of male crabs is determined and the allowable quota in advance of the commercial catch is predicted.

Hawaii H-6-R — Henry M. Sakuda — Completed 1969 — $20,434

Management and development investigation of the Kona crab (Ranina serrata) - The extent and abundance of Kona crabs on the fishing grounds were studied. Also, methods of harvesting and development of more effective gear for harvesting the resource were investigated.

Louisiana 2-92-R — B.D. Adkins — Completed 1972 — $96,000

A study of the blue crab fishery in Louisiana - The methods for harvesting blue crab commercially, environmental factors affecting annual production, and the economic significance of the fishery were investigated.

Maryland 3-108-R — Stephen D. Sulkin — Completed 1973 — $240,000

Blue crab study in the Chesapeake Bay - This was a joint undertaking by Maryland Department of Chesapeake Bay Affairs and the Virginia Marine Resources Commission to determine how various factors such as fishing pressure, parent stock size, and environmental phenomena influence population size and distribution of blue crab.

Mississippi 2-123-R — J.Y. Christmas — $28,300

A study of the blue crab fishery in Mississippi - The life history and dynamics of the blue crab and related species are studied to determine environmental factors influencing the fluctuations of productions. Additionally, the effects of sport-commercial fishery conflicts on the resource are investigated.

Oregon 1-5-R — Paul H. Reed — Completed 1970 — $67,774

Controlled rearing of Dungeness crab larvae and the influence of environmental conditions on their survival - This project at Oregon State University's Marine Science Center at Newport was to develop techniques for the identification and rearing of Dungeness crab larvae and to study how dissolved oxygen concentrations, temperature, and salinity affect the larvae distribution and survival of larvae. The feasibility of hatching and rearing crab larvae on a commercial basis was explored.

Rhode Island 3-43-R — Andreas Holmsen — Completed 1969 — $43,500

Investigation of the deep-sea red crab (Geryon quinquedens) - The cost involved in handling the deep-sea red crab, both on a trawler and in a processing plant, and the market characteristics of the species were investigated.

Rhode Island 3-46-R — George W. Gray, Jr. — Completed 1969 — $21,600

Investigation of the basic life history of the red crab - Growth, age at sexual maturity, spawning and molting seasons, migratory behavior, and natural mortality of the red crab were investigated.

Washington 1-52-R — Herb C. Tegelberg — Completed 1971 — $41,000

Dungeness crab study - This project was undertaken to determine the mortality rate of soft-shelled crabs discarded at sea, to develop a method for determining crab quality, to measure crab quality for a 2-year period, and to develop methods for tagging or marking.

Washington 1-76-R — Herb C. Tegelberg — $14,500

Dungeness crab study - This project continues the State's effort for development of marking techniques for small crab, improvement in method of handling soft-shell crab, and determination of condition of the crab, and obtaining information on feeding habits in the ocean.

Lobster:

Connecticut 3-44-R — William Lund, Jr. — Completed 1970 — $99,836

Investigations on the lobster - The population structure and ecology of a designated area near Ram Island were studied with the use of SCUBA gear. Routine observations were made to determine movement, behavior, and bottom type preferred by lobsters. Plankton tows were also made weekly during the spring and summer to define the period when lobster larvae were present.

Connecticut 3-130-R — William Lund, Jr. — Completed 1973 — $74,400

Ecology, population structure, and movements of lobsters - Seasonal composition and distribution of lobster populations in Long Island and Fishers Island Sounds were determined. Information was obtained also on movements, activities, and growth and frequency of molting of lobsters in the study areas.

Hawaii H-5-R — Henry M. Sakuda — Completed 1969 — $10,144

Management investigation of two species of spiny lobsters, Panulirus japonicus and P. penicillatus - Previously collected data on the spiny lobster relative to net and trap catches, migration, molting frequency, growth, and reproduction were analyzed.

Maine 3-14-R — James Thomas — Completed 1971 — $309,600

Lobster research program - This study was concerned with obtaining and analyzing biological and statistical data on the inshore fishery for management purposes. Catch statistics from 152 dealers located throughout the coastal counties were analyzed. Samples were also taken each month from 10 different locations along the inshore area to determine changes in length, weight, sex ratio, and maturity of the lobster.

Maine 3-153-R — James Thomas — $70,300

Lobster research program - Data are collected on the lobster stocks and the fishery in the inshore waters of the Gulf of Maine to estimate the biological minimum size for maximum yield to the fishermen.

New Hampshire 3-155-R — Edward W. Spurr — $30,000

Lobster research program - Objectives of the study are to gather statistics on the lobster fishery, obtain information on the species harvested, and determine environmental influences on the catch.

New York 3-100-R — Roy L. Haje — $18,500

A study of burrow selection by the American lobster - The behavior of lobster in regard as to the size and shape of the burrow is investigated to obtain information for management of the resources.

Puerto Rico 2-97-R — Robert Y. Ting — Completed 1972 — $63,742

Investigations on the resource potential of the spiny lobster (Panulirus argus Latreille) in Puerto Rico - This project was undertaken to determine the condition of the lobster fishery, determine catch from various fishing grounds, and explore new fishing grounds, especially in depths beyond 20 fathoms.

Mussel:

Indiana 4-10-R — Louis A. Krumholz — Completed 1968 — $31,960

Mussel research study - To inventory the mussel resources, the Wabash and White Rivers have been sampled with crowfoot bar at 50 1-mile stations. Biological and life history information, such as reproductive success, age, and growth, has been obtained for evaluation of management regulations.

Kentucky 4-19-R — John C. Williams — Completed 1969 — $45,800

Mussel fishery investigations - The location and extent of the mussel beds, species composition, population density, harvest, recruitment, and reproduction of mussels in the Tennessee, Green, and Ohio Rivers in Kentucky were investigated. This work was done at the Murray State University Biological Station at Murray.

Ohio 4-28-R — John M. Bates — Completed 1970 — $114,500

Mussel fisheries investigation - Studies were made on the Muskingum, Scioto, and Little Miami Rivers in southeastern Ohio to determine the distribution of the mussel beds and to obtain biological and life history information for the species present. An estimate also was made of the annual harvest by collectors. Information obtained will provide the basis for a management program for the State's mussel resources.

Pennsylvania 3-85-R — John M. Bates — Completed 1969 — $20,000

Mussel investigations - The location and extent of the mussel beds, both qualitatively and quantitatively, in the Ohio River drainage within the State were investigated. Samples were collected to obtain species composition, stage of maturity, and rate of growth. How various harvesting techniques affect the mussel beds was studied also.

Tennessee 4-46-R — Paul Yokley, Jr. — Completed 1972 — $56,868

Freshwater mussel ecology, Kentucky Lake, Tennessee - This study was designed to evaluate the types of habitat of established mussel beds and to determine the density and species composition of each site. Mussels were tagged, and the shell erosion, age range, number of species, and their density were correlated with the water quality and bottom type of the area.

West Virginia 3-97-R — John M. Bates — Completed 1971 — $61,250

Mussel investigations - This was a coordinated study with Ohio and Pennsylvania to determine the distribution and extent of mussel beds within the Ohio drainages of the respective States. Also, other pertinent life history information such as rate of recruitment, rate of growth, age composition, and reproduction success was investigated.

Oyster:

Alabama 2-18-R — Edwin May — Completed 1968 — $25,430

Oyster raft production - A low-cost raft and cultch material was designed, and research on spat growth related to a changing environment concluded.

Alabama 2-30-D — George Allen — Completed 1967 — $18,100

Shell planting for oyster cultch - An area in Mobile Bay on Point Clear Reef was selected and planted with about 37,309 barrels of shell. A substantial supply of seed oysters resulted from this planting.

Delaware 3-8-D — Ted Ritchie — Completed 1966 — $40,000

Rehabilitation of the natural seed oyster beds in Delaware - The planting of 219,184 bushels of shell has been completed to develop and enlarge several small natural seed oyster beds. A successful spatfall was recorded at each area.

Delware 3-55-R — Ted Ritchie — Completed 1968 — $12,000

A resurvey of the condition and extent of the natural seed oyster beds in Delaware - The survey and evaluation of existing seed oyster beds in Delaware Bay have been completed. Bottom type, abundance of predators and fouling organisms, and abundance and size of oysters present have been recorded.

Delaware 3-98-D — Ted Ritchie — Completed 1969 — $3,600

An experimental planting of seed oysters in Delaware Bay - The primary objective of this project was to determine the feasibility of planting seed oysters in Delaware Bay. Primary objectives included the determination of growth and survival rates and evaluation of commercial oyster production potential.

Delaware 3-142-R — Robert A. Beck — $18,000

Live oyster bed and cultch survey of the Delaware Bay and tributaries - This project will locate, map, and mark the distribution of living oyster beds and cultch in the Delaware Bay and its tributaries. Concurrently, samples of the oyster cultch, plus spot production, will be taken to determine condition of the resource.

Florida 2-52-D — Robert M. Ingle — Completed 1971 — $175,090

Construction of artificial oyster reefs - Natural oyster reefs were established from Tampa Bay north to Choctawhatchee Bay. This project will create permanent areas for oyster attachment and growth and, consequently, commercial production.

Florida 2-150-D — Robert M. Ingle — $50,000

Artificial oyster reef development - This project provides for planting of about 75 acres with cultch materials annually in Apalachicola Bay, Franklin County, during the next 3 years for development of permanent oyster reefs. Plants are made in unpolluted areas and near existing oyster producing areas to insure commercial use. Success of the reefs are evaluated on basis of development cost and stability after planting and value to commercial fishermen and the environment.

Georgia 2-10-R — Thomas Linton — Completed 1968 — $120,900

Feasibility study of methods for improving oyster production in Georgia - An inventory of the intertidal resources has been completed. Pilot studies to find the best methods of cultivation are completed on pond and raft culture.

Hawaii H-2-R — Henry M. Sakuda — Completed 1969 — $34,611

Investigation for the development of a commercial oyster industry - Seed oysters were collected from West Loch, Pearl Harbor, Oahu, and transplanted into Hilo Bay on the island of Hawaii, Kaneohe Bay on the island of Oahu, and other selected ponds and estuarine areas. The oysters are sampled routinely for changes in condition, growth, and mortality.

Hawaii H-13-R — Henry M. Sakuda — Completed 1972 — $65,800

Commercial oyster fishery development investigation - The purpose of this study was to conduct experimental commercial size oyster growing operations with adult, seed, and spat (very young) oysters and investigate methods of producing oysters in commercial quality and quantity for experimental marketing.

Louisiana 2-23-D — John Lay, Sr. — Completed 1970 — $301,338

Oyster lease control monuments - Survey control monuments were established throughout the oyster growing areas to aid in accurate surveys of water bottoms for leasing purposes. The control monuments were constructed of concrete and reinforcing steel rods and placed at about ½-mile intervals.

Louisiana 2-24-D — Max Summers — Completed 1966 — $25,000

Shell planting for oyster cultch - This shell planting project was an overall effort to provide additional shells on selected areas within the oyster seed grounds in Bay Boudreaux and Black Bay.

Louisiana 2-54-D — Max Summers — Completed 1967 — $105,000

Shell planting for oyster cultch - This project provided cultch material for planting on Half Moon area and Black Bay, which are oyster seed grounds east of the Mississippi River. About 33,300 cubic yards of clam shell were planted.

Louisiana 2-72-R — Charles J. White — Completed 1971 — $45,000

Evaluation of experimental oyster-tonging reefs in Calcasieu Lake - The purpose of this project was to evaluate the development of oyster-tonging reefs in Calcasieu Lake. About 10,000 to 15,000 cubic yards of clam shell were planted at predetermined locations.

Louisiana 2-90-R — J.F. Pollard — Completed 1972 — $102,000

Experiments to reestablish historical oyster seed grounds and to control the Southern oyster drill - The purpose of this study was to test various materials to determine which is best suited for use as cultch and to determine through cultch plantings which areas are suitable for reestablishing preexisting oyster seed grounds.

Louisiana 2-114-D — W.S. Perret — Completed 1970 — $199,060

Clam shell planting for oyster cultch - Approximately 56,000 cubic yards of clam shell were planted on 250 acres of bottom in the Caillou oyster seed reservation to provide additional and supplemental cultch material for catching oyster spat and growing seed oysters.

Louisiana 2-118-D — J.W. Lay — Completed 1973 — $280,000

Control monuments for oyster leases - The objective of this project is to establish control monuments throughout the oyster growing areas along the coast at ½-mile spacings on land areas from which surveys of water bottom for oyster leases can be coordinated and identified.

Maryland 3-29-D — Donald Pritchard — Completed 1967 — $18,000

Studies of the physical processes of movement and dispersion of oyster larvae - The major effort of this study was directed toward analysis of the data derived from earlier attempts to use a tracer fluorescent dye to simulate the movement and spread of oyster larvae, and to use this analysis in the design of a field study. The area chosen for the field study was the Manokin River estuary.

New Hampshire 3-32-R — William Ayer — Completed 1969 — $74,767

An investigation of the possibility of seed oyster production in Great Bay, New Hampshire - Population estimates were made in selected areas of Great Bay by SCUBA divers. Life history studies on the seed oysters defined the time of spawning, survival, and growth.

New Jersey 3-1-D — Christopher Riley — Completed 1970 — $757,640

Shell planting program Maurice River Cove (Delaware Bay) and Mullica River (Atlantic Coast) - Oyster shells to serve as cultch were planted on selected beds in the Delaware Bay and Mullica River. Over 2 million bushels of shells were planted to enlarge and rehabilitate seven beds in Delaware Bay and the Mullica and Tuckahoe Rivers.

New Jersey 3-120-D — Joseph Price — Completed 1973 — $305,100

Shell planting program - Seed oysters were moved from Mullica River seed beds to the market oyster beds downstream where they will grow within 2 years to market size. The seed beds were developed by planting of shells under project number 3-1-D.

North Carolina 2-6-R — Howard Marshall — Completed 1969 — $59,280

Oyster studies - Cultch materials were placed in Shallottee River, Lockwoods Folly River, New River, Back Bay, and Deep Bay, and their time of placement was studied in relation to the success of oyster spat. Data on spat abundance, water temperature, salinity, and tidal cycle were also collected.

South Carolina 2-2-R — G. Robert Lunz — Completed 1968 — $46,950

Charting of subtidal oyster beds and experimental transplanting of seed oysters thereto from polluted seed oyster beds - Oysters from the Wando and Santee Rivers that are subjected to several types of pollution were moved to unpolluted areas for natural depuration. Samples were taken routinely to study growth, condition, and survival of the oysters transplanted into the new habitat.

South Carolina 2-69-R — G. Robert Lunz — Completed 1969 — $8,890

Investigation into the supplemental feeding of oysters - In an effort to open new areas of increased productivity of new methods of cultivation, this study investigated the value of supplementary feeding of oysters. Different food substances such as molasses, rice chaff, and starch were used to discover a low-cost, readily available product that would produce rapid weight increases and/or growth. This work was carried out in temperature-controlled, 3,000-gallon capacity concrete tanks at Bears Bluff Laboratories on Wadmalaw Island.

South Carolina 2-105-R — Robert C. Gracy — Completed 1972 — $65,000

Survey of the South Carolina oyster fishery - This project provided for an inventory and survey of the State's commercial oyster fishery to provide information that can be used to formulate recommendations for fish legislation and regulation.

South Carolina 2-179-D — Robert C. Gracy — $53,333

Management and development of the shellfish industry of South Carolina - Oyster harvesting operations, hand and mechanical, are assessed through field observations. Also, management practices are investigated by monitoring results of shell and seed oyster plantings throughout the coastal waters.

Virginia 3-7-R — VIMS Staff — Completed 1966 — $140,800

Investigations of oyster larvae and spat and certain important environmental factors in an horizontally stratified estuary - The movement and dispersion of oyster larvae and spat have been examined in relation to physical factors such as salinity, density gradients, current direction and velocity, light temperature, and oxygen. A model of the James River system was used to determine the rate of movement and dispersion.

Virginia 3-118,179-D — VMRC Staff — $100,000

Shell planting program - Objectives of this project are to plant oyster shell cultch in several public oyster-growing areas so as to provide an adequate spatfall-collecting medium and to obtain from this spatfall a supply of seed oysters which can be transplanted to rehabilitate the oysters in depleted public oyster grounds.

Washington 1-24-D — Cedric Lindsay — Completed 1967 — $6,000

Inspection of oyster seed - new Asiatic sources - Because of the continuing decline of imports of oyster seed from Japan on which the industry depends, a trip was made to Korea and Taiwan to investigate new sources of seed. Oysters were tested for predators and disease to guard against infestation of Pacific oyster grounds. A new oyster seed source that was found in Korea was acceptable under the standards required by the State. The seed sources in Taiwan were not acceptable.

Washington 1-31-R — Clyde Sayce — Completed 1968 — $56,000

Willapa oyster studies - The growth and fatness of Pacific oysters were studied at the Shellfish Laboratory, Nahcotta. Supplemental feeding with starch and materials containing starch, such as powdered milk and egg products, and fish protein concentrate was provided to determine how it affected the fatness and pumping rate of the Pacific oyster. Hydrographic factors that directly affect the retention of oyster larvae to setting size were defined to provide the industry with improved prediction of commercial spatfall.

Scallop:

Alaska 5-13-D — Gary Finger — Completed 1968 — $40,000

Commercial feasibility of Alaska scallop fishery - This project has provided the State with the basic data on abundance and distribution that are needed for management regulations on sea scallop resources in south-central coastal areas of Alaska. The project has stimulated a new scallop industry at Seward.

Alaska 5-23-R — Daniel P. Hennick — Completed 1972 — $99,000

Sea scallop investigations - The objectives of this project were to determine the relative abundance and location of commercially important scallop stocks in coastal areas, to investigate the basic biology of the sea scallop, and to assess damage done to associated species, such as crabs, by scallop dredging.

Rhode Island 3-113-R — Howard Russell — Completed 1972 — $52,300

An experimental seed bay scallop stocking of selected Rhode Island waters - The objectives of this study were to observe rates of growth and predation on bay scallops in certain areas of Rhode Island which have, in the past, produced scallops in large quantities, in order to assess their future production potential.

Rhode Island 3-162-R — John D. Karlsson — $37,150

A study of stabilization of natural scallop populations by augmentation with hatchery reared seed - The purpose of this study is to obtain eggs and sperm from conditioned adult scallop, hatch and rear juveniles for release in areas with good potential for successful growth. Transplanted stocks will be monitored for survival, movement, and time and duration of spawning.

Shrimp:

Alaska 5-20,25-R — Jerry A. McCrary — $92,400

Pandalid shrimp studies - Catch-per-unit-of-effort data collections, stock assessment by seasonal trawl surveys, and life history studies are made on shrimp stocks in the Kodiak-Shumagin-Aleutian areas. Chief effort is around Kodiak Island, the present center of the shrimp industry.

Alaska 5-29-R — Daniel Hennick — $28,100

Cook Inlet shellfish investigations - The purpose of this study is to establish an applied research program for Cook Inlet shrimp fisheries. The commercial fishery will be closely monitored for obtaining information for management purposes. Additionally, a logbook for collecting data on king crab fisheries will be kept for obtaining an index of abundance.

Florida 2-185-R — Frank Kennedy — $104,617

Rock shrimp life history studies and exploratory fishing survey - The objectives of this study are to survey the stocks of rock shrimp off Cape Canaveral and define those with economic potential, and to obtain information on the life history, reproductive cycle, and other biological aspects about the species.

Georgia 2-43-R — Charles M. Frisbie — Completed 1969 — $94,320

Seasonal abundance and biological stability of the commercial shrimp of Georgia - Sampling stations were located offshore in sounds, rivers, and in marshes throughout the shrimps' habitat. Trawl, seine, and plankton net collected adults, postlarval, and larval shrimp throughout the year. Determinations were made on relative and seasonal abundance, growth rate, sex ratio, spawning success, and limiting environmental factors of shrimp.

Georgia 2-87-R — Clifford J. Knowlton — Completed 1971 — $39,310

Preliminary studies of a potential finfish industry from commercial shrimp landings - The purpose of this study was to determine the species composition and marketable size of finfish in commercial shrimp catches and their relative abundance during the commercial shrimping season.

Louisiana 2-21-R — J.G. Broom — Completed 1968 — $124,840

Coastwide study of penaeid shrimp - The life history of the commercially important species of penaeid shrimp in estuary waters was studied to provide information for improved management of these resources including a coordinated effort through the Gulf States Marine Fisheries Commission.

Louisiana 2-93-R — Wilson J. Gaidry — Completed 1972 — $170,000

Investigations of commercially important penaeid shrimp in Louisiana's estuaries - Causes of seasonal fluctuations and abundance in shrimp populations in the estuaries were studied to determine how changes in the estuarine environment affect annual and continued production.

Maine 3-12-R — Ronald G. Rinaldo — Completed 1970 — $134,196

Northern shrimp - biological and technical research - Studies were made on waters adjacent to the Maine coast to determine the relative abundance of species of northern shrimp, particularly Pandalus borealis, and life history and seasonal availability of the several species. Technical problems associated with economical and efficient harvesting and marketing these species were also investigated.

Maine 3-117-R — Ronald G. Rinaldo — $33,500

Northern shrimp - assessment of some population parameters - This project is designed to establish shrimp population parameters by sampling and enhancing the collection, catch, and data from survey cruises.

Mississippi 2-124-R — J.Y. Christmas — $28,000

Investigation of commercially important penaeid shrimp in Mississippi estuaries - Under this project a study is made of the environmental requirements and relationships of penaeid shrimp with special reference to variations in commercial catch in an attempt to improve predictions of the availability of shrimp to the fishery.

North Carolina 2-26-R — Edward G. McCoy — Completed 1969 — $95,050

Shrimp studies - Information was obtained on population dynamics, including migratory behavior, for pink, brown, and white shrimp marked with biological stains and fluorescent pigments and released in nursery areas tributary to Core Sound and Lower Cape Fear River estuaries. A combined total of 26,989 shrimps were marked and released, of which 1,671 or 6.2 percent were recaptured. Mark and recapture studies on brown shrimp were conducted in Pamlico Sound and Bogue Sound estuaries, including Newport River.

North Carolina 2-129-R — Connell Purvis — Completed 1972 — $83,000

Studies of commercial penaeid shrimp - This study was undertaken to determine the effect on the resulting commercial catch when precommercial-size pink shrimp are harvested and discarded while fishing for commercial-size brown shrimp.

Oregon 1-3-R — Gary Milburn — Completed 1970 — $141,832

Study on the distribution and abundance of pink shrimp, Pandalus jordani, in the Pacific Ocean off Oregon - Sampling of commercial pink shrimp landings at Warrenton, Newport, and Coos Bay has been completed. Length frequency, catch, and effort data by area of catch were reported. The vertical distribution and migratory behavior of this species by diel, lunar, and seasonal periods, and the environmental factors which may influence these movements were investigated off the Oregon coast near Astoria and Newport.

Oregon 1-62-R — Robert Loeffel — Completed 1971 — $28,500

An evaluation of methods for determining movements of shrimp - This study was twofold: (1) to evaluate the feasibility of various techniques of determining the movements of Pacific pink shrimp, and (2) to develop holding and rearing techniques of pink shrimp in aquaria.

Texas 2-132-R — Gary M. Stokes — Completed 1972 — $53,647

The population and distribution of penaeid shrimp in Lower Laguna Madre - The purpose of this study was to determine the population and distribution of juvenile penaeid shrimp in Lower Laguna Madre and its watershed with relation to ecological factors, and conduct a brief survey of the bait shrimp fishery in the Lower Laguna Madre in preparation for future studies dealing with the relationship between juvenile production in the Lower Laguna Madre, the bait fishery, and commercial production in the Gulf of Mexico.

Texas 2-202-R — C.E. Bryan — $80,000

Study of commercial shrimp, rock shrimp and commercial finfish - The objectives are to determine the extent of the spawning grounds, movements and growth rates of white shrimp after they enter the Gulf from the estuaries, and amount and types of finfish captured by the commercial shrimping fleet on the brown shrimp fishing grounds, and delineate the areas of abundance of the rock shrimp and evaluate their fishery potential.

Others:

Alabama 2-201-R — Edgar A. Hughes — $25,000

Studies of oyster reef cultivation and artificially inducing crab molting - The objectives of this study are to: (1) compare oyster production and cost on cultivated reef plots versus plots which have been planted with shells only; (2) determine the concentration of various hormones required to induce molting of blue crabs; and (3) determine the economic feasibility of producing soft-shell crabs by hormone injection.

New York 3-116-D — John Hofmann — $16,800

Shellfish sanitation control - The objective of this project is to permit on-scene microbiological examination of shellfish and water samples, thus avoiding the hazards of interpreting results from samples which have been in refrigerated storage for even a few hours.

Rhode Island 3-57-R — Saul B. Saila — Completed 1967 — $11,275

Mollusk environmental modification and control studies - The State terminated this study during the first year.

Texas 2-55-R — B.D. King — Completed 1970 — $126,630

Study of migratory patterns of fish and shellfish through a natural pass - A series of nets were fished in Cedar Bayou Pass to investigate the abundance of larval and postlarval shellfish and fish that move from the Gulf of Mexico into the coastal bays and estuaries.

RESOURCE DISASTER PROJECTS

Since initiation of the program in 1965, resource disaster funds have been used 14 times. The total amount involved was $1,950,000, with a minimum of $5,600 and a maximum of $400,000; the average was $139,285. Of the projects funded, $386,856 has been used for resource disasters involving diseases in blue crab and oysters, $963,144 for restoration of oyster resources damaged by hurricanes and other natural causes, and $600,000 for the Great Lakes chub and the New England haddock fishery disasters.

Alabama 2-64-D	Johnie H. Crance	Completed 1969 $45,000

Restoration of Alabama's supply of seed oysters - To restore and establish a new source of seed oysters for Mobile Bay, about 125 acres of selected bottom in Mississippi Sound were planted with 500,000 cubic feet of shell. The areas selected are least affected by the hazards of seed production.

Alabama 2-102-D Louisiana 2-101-D Mississippi 2-103-D	Johnie H. Crance Ted B. Ford William J. Demoran	Completed 1970 $281,400

Restoration of public oyster reefs damaged by Hurricane Camille - To help restore damaged oyster resources resulting from Hurricane Camille in August 1969, approximately 40,000 barrels of oyster shell were planted on the Cedar Point oyster reef in Mobile County, Alabama, 60,000 cubic yards within natural seed grounds of the Mississippi River waters in eastern Louisiana, and 50,000 cubic yards in the western portion of Mississippi Sound and Heron Bay in Mississippi.

Alabama 2-165-D	Edwin B. May	Completed 1972 $70,000

Restoration of an oyster resource destroyed by natural causes - In August 1971 the oyster resource on Point Clear Reef in Mobile Bay became unproductive because of extensive mortality from low oxygen. This project planted 77,500 barrels of cultch material on opposite side of the bay in a suitable and productive area that restored the resource for the same segment of the industry.

Connecticut 3-51-D	Ernest Bontya	Completed 1967 $200,000

Disaster relief - Fifteen spawning beds in selected locations of Long Island Sound were cleaned, protected with predator control materials, and planted with 400 bushels of brood stock oysters to evaluate the set obtained. The first spawning should provide seed oysters and brood stock for several years.

Delaware 3-49-R Maryland 3-20-R New Jersey 3-3-R Virginia 3-6-R	Kent Price Victor Sprague Harold Haskin Jay Andrews	Completed 1967 $178,000

Disease-resistant oysters program - Potentially disease-resistant oysters were planted in infested areas in an attempt to develop disease-resistant stocks while at the same time disease agents and their relation to the oyster hosts were studied.

Florida 2-81-R Georgia 2-82-R North Carolina 2-80-R South Carolina 2-79-R	Sean Bollar Robert Mahood John R. Davis G. Robert Lunz	Completed 1970 $75,000

Cooperative blue crab study - South Atlantic States - A cooperative research study was conducted in each State to obtain data on hydrology, occurrence of disease and parasites, and levels of pesticides in its waters. An evaluation of the relationship to these items and abundance of blue crab was made.

Florida 2-167-D — Robert M. Ingle — Completed 1973 — $200,000

Reestablishment of destroyed oyster reefs - When the oyster season opened in September 1971 heavy oyster mortality from fungus was discovered in reefs on east bank of Escambia Bay. This project restored the destroyed resource by constructing about 150 acres of public oyster reefs in new and productive areas in northwest counties.

Great Lakes States — State Personnel — Completed 1966 — $400,000

Restoration of chub fishery - The objectives of project were to restore chub fishery affected by a botulism disaster and to prevent a similar failure of the fishery in the future.

Louisiana 2-27-D — Max Summers — Completed 1966 — $100,000

Rehabilitation and restoration of oyster seed ground - To rehabilitate the oyster seed grounds damaged by Hurricane Betsy, 630,000 bushels of clam and/or reef shell were planted in selected areas in Bay Boudreaux and Black Bay.

Maryland 3-91-R — Robert Lippson — Completed 1969
Virginia 3-91-R — W.A. Van Engel — $50,000

Blue crab study in Chesapeake Bay - This study by Maryland and Virginia developed a long-term program of study on environmental and biological factors influencing the abundance and distribution of the blue crab.

Massachusetts 3-107-R — Charles E. Martin — Completed 1970 — $200,000

Disaster relief: Massachusetts haddock fishery - Project objective was to conserve and rehabilitate haddock stocks through a program of fishing gear conversion and diversification of fishing effort.

Michigan 4-63-D — Raymond D. Schofield — Completed 1970 — $65,000

Whirling disease control - The objectives of this project were to determine the incidence of whirling disease and control needs and to carry out control operation in an attempt to eradicate the disease in Michigan inland waters.

North Carolina 2-173-D — Completed 1973 — $80,000

Rehabilitation of oyster grounds damaged by Hurricane Ginger 1971 - To help restore losses caused by Hurricane Ginger in September 1971, about 200,000 bushels of shells and marl were planted in Pamlico Sound.

Texas 2-65-D — Robert Hofstetter — Completed 1969 — $5,600

Oyster rehabilitation in San Antonio Bay - To increase oyster spat setting as a means of repopulating public reefs damaged by Hurricane Beulah in 1968, about 15,000 bushels of oyster brood stock were dredged from Galveston Bay and transplanted on depleted reef sites in San Antonio Bay.

STATISTICS

Twenty-six projects for collection, compilation, and dissemination of fishery statistics have been initiated. Of these, 16 have been completed at a total cost of $1,776,246, and 10 are at various stages of completion at an estimated total cost of $458,332.

Alaska 5-3-D — Barbara Hill — Completed 1969 — $43,800

Expansion of current and development of additional commercial fisheries catch, production, and gear statistics - This study was undertaken to increase the accuracy and reliability of current statistics and to compile and publish fishery statistics on an area and individual fishery basis, rather than on the regional or Statewide basis.

Alaska 5-16,27-D — Eldred Butcher — $18,000

Expansion of current and development of additional commercial fisheries catches, production, and gear statistics - This project is undertaken to expand collection, compilation, and publication of commercial fishery statistics needed for management of the resources. This involves detailed complete and accurate catch, production, and gear statistics for use by private, State, Federal, and international agencies.

American Samoa H-18-D — Stanley N. Swerdloff — $10,000

Statistical analysis of American Samoa's fisheries - Data are collected from the longline fishery for the Honolulu Biological Laboratory of National Marine Fisheries Service, catch reporting system is implemented for the subsistence fishery in conjunction with a village fishery training program, and the local fisheries are monitored under this project.

Arkansas 2-157-D — William Bailey — $10,867

Commercial fishery industry survey - Statewide inventory is made on the extent and value of the commercial fishery and fish farming industry valued at an estimated $1 million and $9 million, respectively. Information obtained would be used in management and regulation of these resources.

California 6-6-D — H.G. Orcutt — Completed 1969 $23,644

Port sampling - Crescent City, Brookings, Port Orford - This project was undertaken to sample three distinct fisheries--crab, shrimp, and bottomfish--for landings and to collect and analyze biological data. The observations and data were used to determine changes in abundance, size, and age composition or stock status that are prerequisite to effective management of these resources. Catches were sampled in Crescent City, and in the Brookings and Port Orford, Oregon, areas.

California 6-8-D — H.G. Orcutt — Completed 1970 $236,000

California shellfish and bottomfish data analysis - The purposes of this project were to evaluate management policy and methods and develop a management plan for the crab, shrimp, and bottomfish resources. Catch and effort data and cruise information were compiled, machine processed, programmed for computer analysis, and published. The work was at the California Department of Fish and Game Marine Resources Operations Laboratory at Menlo Park.

California 6-12-D — Richard F.G. Heimann — Completed 1973 $255,000

Shellfish and bottomfish data analysis - Catch and effort data and research cruise information for crab, shrimp, and bottomfish resources were compiled, machine processed, programmed for computer analysis, and published.

Kentucky 2-171-R — Robert Hoyt — $5,600

Commercial fisheries investigations of Nolin and Rough River reservoirs - Information is obtained on number of commercial fishermen, record of their harvest, and value of the fisheries on the Nolin and Rough River reservoirs for management purposes.

Massachusetts 3-37-D — Richard W. Beals — Completed 1973 $134,945

Collection, compilation, evaluation, and dissemination of commercial fisheries statistics - This project provided for new and improved statistics on lobster, alewife, and shellfish fisheries. The landing statistics, including location, catch, effort, and gear for alewife and shellfish, were collected from licensed Massachusetts fishermen and other trawlers. Statistics were compiled, evaluated, and disseminated in monthly bulletins in cooperation with the National Marine Fisheries Service.

Missouri 4-3-R — John W. Robinson — Completed 1972 $151,557

Research and management of commercial fisheries - This project was carried out on the Mississippi and Missouri Rivers in Missouri to improve the accuracy of commercial fish landings.

Missouri 2-199-R — John W. Robinson — $22,466

Research and management of Missouri's commercial fishery resources - Data are compiled from monthly and annual catch of commercial fishermen by gear on the Missouri, Mississippi, and lower St. Francis Rivers. Marketing statistics will be collected on the catch also.

Nebraska 2-195-R — Monte L. Madsen — $11,333

Survey of the commercial fisheries of Nebraska - The objective of this survey is to develop and implement a Statewide statistical reporting system for all commercial fisheries operations, including bait vendors, private hatcheries, and Missouri River commercial fishery. Also, the economic significance of the commercial fishery industries to the State is evaluated.

New York 3-139-D — Albert C. Jensen — Completed 1972 $105,000

Commercial fishery statistical program for the State of New York - Commercial fishery statistics were collected for the otter trawl at Greenport, Montauk, and Hampton Bays on Long Island Sound and for the ocean seine fishery on the south shore of Long Island. Additionally, biological data were collected from fish landed. Major species of interest included flounder, scup, hake, striped bass, weakfish, and bluefish.

Oklahoma 4-25-D — Gary Mensinger — Completed 1969 $30,140

Commercial fishery statistics - Under this project, landing statistics on all marketable and nonmarketable fish taken by commercial gear were compiled. Some information was obtained on the number of each species taken and the size composition of the catch. The Texoma, Eufaula, Ft. Gibson, Grand, and Hudson Reservoirs were of prime interest.

Oregon 1-61-R — Wallace Hublou — Completed 1971 $38,500

Data analysis - Dover sole stocks - Provided for completion of data analysis and submission of reports for publication on Dover sole population dynamics. Also, results of survey of Dover sole stocks in deep coastal waters were distributed.

Oregon AFC-51 — Louis Fredel — Completed 1973 $200,000

Salmon and steelhead mark processing center for Pacific Coast States - Provided for regional center for processing data obtained from sampling catches and hatchery returns of salmon and steelhead trout and for distribution of landing statistics.

Puerto Rico 2-56,182-R — José A. Suárez Caabro — $75,000

Fisheries statistical program - This project is undertaken to design and establish a fisheries statistics system that, in addition to assisting the local industry, would also provide the statistical needs of the National Marine Fisheries Service and other interested agencies. Statistical landings will include number and types of fishing crafts and number of fishermen.

South Carolina 2-137-D — Raymond Rhodes — $26,000

Development of an expanded commercial fisheries statistics program - This project is undertaken to develop an improved commercial fisheries statistical program through expanded data collection and the establishment of capabilities to process and evaluate these data. The data headquarters would be located in Charleston, S.C., and would coordinate the program with the Statistics and Market News Division, National Marine Fisheries Service, and the State's Division of Research and Statistical Reports.

South Dakota 4-18-D — Donald Warnick — Completed 1972 $88,000

Commercial fishery industry survey - This project provided for the development of a continuous system for the collection of statistics for all commercial fisheries and dealers of fish products in the State.

South Dakota 1-84-D — Donald C. Warnick — $3,000

Publication of commercial fishing information - Objectives are to prepare and publish bulletin to inform the public of the State's commercial fishery program in management and to publish pertinent findings of a commercial fishing industry survey.

Texas 2-49-R — Claude L. Hamilton, Jr. — Completed 1971 $67,860

Commercial fishery landings statistical program - study #1 - The National Marine Fisheries Service now gathers and compiles data on shrimp landings, while the Texas Parks and Wildlife Department gathers and tabulates statistical landings on fish, crabs, and oysters. The Department's statistical system from the coastal areas was upgraded so that landing data could be used to interpret research findings and to evaluate management programs.

Texas 2-146-D — Claude L. Hamilton, Jr. — $29,004

Commercial fishery landings statistical program - study #2 - This project is the second phase of the State's fisheries program to gather, compile, publish, and make available fishery statistics for fish, crab, and oyster landings from the coastal area.

Virginia 3-174-D — VMFC Staff — $9,333

Fisheries statistics and library program - The purpose of this project is to upgrade the reliability of Virginia's fisheries statistics and to catalog such statistics and other statistical information for immediate and meaningful retrieval.

Washington 1-71-R — A. Millikan — Completed 1971 $14,000

Mid-water trawl fishery data analysis - This project analyzed catch-effort and biological data collected in the 1969-70 hake fishery in Puget Sound, published results of analysis of data collected 1965-69 on the fishery, and analyzed acoustical hake census collected 1969-70.

Wisconsin 4-42-D — William B. Lord — Completed 1968 $5,800

The alternatives for Lake Superior trout management - a system of analysis - Statistics were gathered on the trout fishery as part of an investigation involving the interrelation of sport and commercial fishing interests.

Wisconsin 3-133-R — Willie Fernholz — Completed 1972 $12,000

Status of fish populations in Pool 7 of the Mississippi River and probable effects of commercial gill net fishery - The purpose was to determine year-class strength of fish species encountered in the Pool 7 gill net catch and relate these data to conditions prior to the closure of the fishery in 1964 as basis for management of the fishery.

PUBLICATIONS

In carrying out project activities about 300 State scientists are continuously employed to gather information for better management of the fishery resources and to solve fishery problems. These studies have resulted in 309 publications, of which 251 have appeared in scientific journals and 58 have been for partial fulfillment of the requirement for advanced degrees from educational institutions. Following are the literature citations for the publications with State and grant-in-aid project numbers in parentheses followed by the National Technical Information Service (NTIS) accession number.

Paper or microfiche copies of publications, theses, and unpublished completion reports from NMFS grant-in-aid projects as well as reports from NOAA scientific research and other Federal Government activities are available for a fee from NTIS at the address given below:

National Technical Information Service
U.S. Department of Commerce
Springfield, Virginia 22151

When ordering please use the accession number, if known. To obtain information on the availability of NMFS grant-in-aid reports or publications not included in this list, contact the appropriate NMFS Regional Office (see page 156).

ACOSTA, DANNY J.
1970. The copepods south of Dog Keys Pass: Their abundance, distribution, seasonal variation, temperature and salinity tolerances. Ph.D. thesis, Univ. S. Miss., Hattiesburg, 78 pp. (Miss. 2-42-R) COM-72-11174

ADAMS, JOHN G.
1970. Clupeids in the Altamaha River, Georgia. Ga. Game Fish Contrib. 20, 27 pp. (Ga. AFC-6) COM-72-10037

ADAMS, JOHN G., and MICHAEL W. STREET
1969. Notes on the spawning and embryological development of blueback herring, (Alosa aestivalis Mitchell), in the Altamaha River, Georgia. Ga. Game Fish, Art. 16, 13 pp. (Ga. AFC-6)

ADKINS, GERALD
1972. Notes on the occurrence and distribution of the rhizocephalan parasite (Loxothylacus texanus Boschma) of blue crabs (Callinectes sapidus Rathbun) in Louisiana estuaries. La. Wildl. Fish Comm., Tech. Bull. 2, 13 pp. (La. 2-92-R) COM-73-10448

AMBROSE, JEARLD, JR.
1970. Fecundity, food habits, age and growth, length-weight relationships and condition of channel catfish, Ictalurus punctatus (Rafinesque), in a 3300-acre turbid Oklahoma reservoir. M.S. thesis, Okla. St. Univ., Stillwater, 60 pp. (Okla. 4-24-R) COM-72-10180

ANDERSON, CHARLES O., JR., and LARRY R. SCHOFIELD
1969. 1968 Massachusetts coastal lobster fishery statistics. Div. Mar. Fish., Tech Serv. 4, 19 pp. (Mass. 3-37-D)

ANDERSON, EMORY D.
1969. Factors affecting abundance of lake herring, Coregonus artedii LeSueur, in western Lake Superior. Ph.D. thesis, Univ. Minn., St. Paul, 162 pp. (Minn. 4-8-R)

ANDERSON, EMORY D., and LLOYD L. SMITH, JR.
1971. Factors affecting abundance of lake herring (Coregonus artedii LeSueur), in western Lake Superior. Trans. Amer. Fish. Soc. 100(4): 691-707. (Minn. 4-8-R)

1971. A synoptic study of food habits of 30 fish species from western Lake Superior, Univ. Minn., Agr. Exp. Sta., Tech. Bull. 279, 199 pp. (Minn. 4-8-R) COM-72-11422

ANDERSON, RONALD J.
1972. Artificial diets for smallmouth bass. M.S. thesis, Colo. St. Univ., Fort Collins, 59 pp. (Colo. 6-11-D)

ANDREWS, AUSTIN KENT
1970. The distribution and life history of the fathead minnow (Pimephales promelas Rafinesque) in Colorado. Ph.D. thesis, Colo. St. Univ., Fort Collins, 131 pp. (Colo. 6-2-D) COM-72-10271

1972. Survival and mark retention of a small cyprinid marked with fluorescent pigments. Trans. Amer. Fish. Soc. 101(1): 128-133. (Colo. 6-2-D) COM-72-10702

ANDREWS, JAMES W.
1970. Proceedings of conference on high-density fish culture. Ga. Game Fish Comm., 86 pp. (Ga. 2-84-R) COM-72-01114

1972. Stocking density and water requirements for high-density culture of channel catfish in tanks or raceways. Feedstuffs 44(6): 40. (Ga. 2-84-R) COM-72-11100

ANDREWS, JAMES W., and ROBERT R. STICKNEY
1971. Interactions of feeding rates and environmental temperature on growth, food conversion, and body composition of channel catfish. Trans. Amer. Fish. Soc. 101(1): 94-99. (Ga. 2-84-R) COM-72-11365

ANDREWS, J.W., L.H. KNIGHT, J.W. PAGE, Y. MATSUDA, and E.E. BROWN
1971. Interactions of stocking density and water turnover on growth and food conversion of channel catfish reared in intensively stocked tanks. Prog. Fish-Cult. 33(4): 197-203. (Ga. 2-84-R) COM-72-10913

APOLLONIO, S.
1969. Breeding and fecundity of the glass shrimp, Pasiphaea multidentata (Decapoda caridea), in the Gulf of Maine. J. Fish. Res. Bd. Can. 26: 1969-1983. (Me. 3-12-R)

ARSCOTT, G.H., and DAVID L. CRAWFORD
1969. The effect of hake meal in broiler rations. Poultry Sci. 48(3): 1123-1125. (Oreg. 1-12-R) COM-72-11053

ASADI, S.A.
1967. Effect of temperature on the digestive enzymes of channel catfish, Ictalurus punctatus (Rafinesque). M.S. thesis, Kans. St. Univ., Manhattan, 65 pp. (Kans. 4-1-R)

AU, DAVID W.K.
1971. Population dynamics of the coho salmon and its response to logging in three coastal streams. Ph.D. thesis, Oreg. St. Univ., Corvallis, 245 pp. (Oreg. AFC-46)

AYER, W.C.
1970. Soft-shell clam population study in Hampton-Seabrook Harbor, New Hampshire. N.H. Fish Game Dep. Mar. Surv. Rep. 1, 39 pp. (N.H. 3-31-R) COM-72-11180

AYER, W.D., B.W. SMITH, and R.D. ACHESON
1970. An investigation of the possibility of seed oyster production in Great Bay, New Hampshire. N.H. Fish Game Dep., Mar. Surv. Rep. 2, 106 pp. (N.H. 3-32-R) COM-72-10402

BALL, GARY
1971. Alaska catch and production 1969 commercial fisheries statistics. Dep. Fish. Game, Leafl. 19, 46 pp. (Alaska 5-16-D) COM-72-10466

1972. 1970 Alaska catch and production commercial fisheries statistics. Dep. Fish. Game, Leafl. 21, 49 pp. (Alaska 5-16-D) COM-72-10465

BALDWIN, R.E., K.G. SIDES, and J.W. ROBINSON
1969. Relationship of size and body area to the flavor and aroma in fish. Trans. Amer. Fish. Soc. 93: 533-537. (Mo. 4-34-D) COM-72-11264

BALDWIN, R.E., K.G. SIDES, MARION CLONINGER, BERNICE KORSCHGEN, and J.W. ROBINSON
1970. Palatability of three species of fish and aroma of water from sites on the Mississippi River. J. Food Sci. 35: 413-417 (Mo. 4-34-D) COM-72-10092

BARRETT, BARNEY B.
1970. Water measurements of coastal Louisiana. La. Wildl. Fish Comm. Pub., 196 pp. (La. 2-22-R) COM-72-10085

1971. Cooperative Gulf of Mexico estuarine inventory and study, Louisiana: Phase II, Hydrology, and Phase III, Sedimentology. La. Wildl. Fish Comm., 191 pp. (La. 2-22-R) (II) COM-72-11306 (III) COM-72-11307

BARTH, GLENN R.
1968. An economic study of the processing and marketing of Montana commercial fisheries products. Univ. Mont., School Bus. Admin., 99 pp. (Mont. 1-45-R)

1969. Montana's commercial fish. Mont. Bus. Quart. 7(4): 22-30. Univ. Mont., Missoula. (Mont. 1-45-R) COM-72-11054

BATTISTI, ROGER J.
1970. A study of the age and growth of yellow perch from three Wyoming impoundments. M.S. thesis, Univ. Wyo., Laramie, 104 pp. (Wyo. 1-48-R) COM-72-11074

BAULT, EDWARD J.
1972. Hydrology of Alabama estuarine areas - cooperative Gulf of Mexico estuarine inventory. Ala. Mar. Res. Lab. Mar. Res. Bull. 7, 25 pp., plus appendix. (Ala. 2-34-R) COM-72-10468

BAYLEY, SUZANNE, HARVEY ROBIN, and CHARLES H. SOUTHWICK
1968. Recent decline in the distribution and abundance of Eurasian milfoil in Chesapeake Bay. Chesapeake Sci. 2: 173-181. (Md. 3-56-R) COM-72-10369

BEALL, EDWARD P.
1972. The use of predator-prey tests to assess the quality of chum salmon Oncorhynchus keta fry. M.S. thesis, Univ. Wash., Seattle, 105 pp. (Wash. AFC-50)

BEALS, RICHARD W.
1970. 1969 Massachusetts coastal lobster fishery statistics. Mass. Dep. Natur. Res., Pub. 5484, 19 pp. (Mass. 3-37-D)

BEALS, RICHARD W., and J. RICHARD JONES
1971. 1970 Massachusetts coastal lobster fishery statistics. Mass. Div. Mar. Fish., Tech. Serv. 6, 19 pp. (Mass. 3-37-D) COM-73-10726

BEARDEN, CHARLES M., and MICHAEL D. MCKENZIE
1971. An investigation of the offshore demersal fish resources of South Carolina. S.C. Wildl. Res. Dep., Tech. Rep. 2, 19 pp. (S.C. 2-110-R) COM-72-10053

BECKETT, ROBERT L.
1967. Occurrence of the fungus Dermocystidium marinum in the American oyster in Chincoteague Bay. Chesapeake Sci. 8(4): 261-262. (Md. 3-20-R)

BERG, LAWRENCE R.
1970. Preliminary studies of the nutritive value of hake meal for poultry. U.S. Fish Wildl. Serv. Cir. 332, pp. 143-148. (Wash. 1-41-R) COM-72-11052

BLAUFUSS, LAWRENCE GENE
1968. Commercial market for North Dakota fish. M.S. thesis, N. Dak. St. Univ., Fargo, 132 pp. (N. Dak. 4-20-D) COM-72-11044

BONNEAU, DONALD L.
1970. Effects of four treatments on the food habits and growth of channel catfish fry, Ictalurus punctatus. M.S. thesis, Kans. St. Univ., Manhattan, 71 pp. (Kans. 4-45-R) COM-72-10170

BONNEAU, D.L, J.W. MCGUIRE, O.W. TIEMEIER, and C.W. DEYOE
1972. Food habits and growth of channel catfish fry, Ictalurus punctatus. Trans. Amer. Fish. Soc. 101(4): 613-619. (Kans. 4-1-R)

BRICKMAN, LAWRENCE M.
1972. Base food chain relationships in coastal salt marsh ecosystems. Ph.D. thesis, Lehigh Univ., Bethlehem, Pa., 179 pp. (N.J. 3-114-R)

BROWN, R.J.
1968. Population structure and growth characteristics of the whitefish in northern Lake Michigan 1929-1967. M.S. thesis, Univ. Mich., Ann Arbor. (Mich. 4-2-R) COM-72-10258

BROWNELL, WILLIARD N., and WILLIAM R. RAINEY
1971. Research and development of deep water commercial and sport fisheries around the Virgin Island Plateau. Carib. Res. Inst., Spec. Rep. 3, 88 pp. (Virgin Is. 2-121-R) COM-71-01150

BUCK, D. HOMER, RICHARD J. BAUR, CHARLES F. THOITS III, and C. RUSSELL ROSE
1972. Combined culture of channel catfish and golden shiners in wading pools. Ill. Nat. Hist. Surv., Biol. Notes No. 79, Urbana, Ill., 12 pp. COM-73-10810

BURNETT, JOSEPH W.
1971. An electron microscopic study of two nematocytes in the tentacle of Cyanea capillata. Chesapeake Sci. 12(2): 67-71. (Md. JF-3-1) COM-72-11363

1971. An ultrastructural study of the nematocytes of the polyp of Chrysaora quinquecirrha. Chesapeake Sci. 12(4): 225-230. (Md. JF-3-1) COM-72-11186

BURNETT, J.W., and RONALD GOLDNER
1968. Studies on sea nettle stings. Arch. Dermatol. 98: 587-589. (Md. JF-3-1)

1968. A physical and chemical study of the sea nettle nematocysts and their toxin. J. Invest. Dermatol. 51: 330-336. (Md. JF-3-1) COM-72-10370

1969. Effects of Chrysaora quinquecirrha (sea nettle) toxin on the rat cardiovascular system. Proc. Soc. Exp. Biol. Med. 132(1): 353-356. (Md. JF-3-1) COM-72-10368

1969. The chemical composition of sea nettle nematocysts. Fed. Proc. 28(2898): 77. (Md. JF-3-1)

1970. Observations in the pathogenesis of sea nettle stings. Fed. Proc. 29(411): 317. (Md. JF-3-1)

1970. Partial purification of sea nettle (Chrysaora quinquecirrha) nematocyst toxin. Proc. Soc. Exp. Biol. Med. 133(3): 978-981. (Md. JF-3-1) COM-72-11234

1971. Some immunological aspects of sea nettle toxins. Toxicon 9: 271-277. (Md. JF-3-1) COM-72-11188

BURNETT, JOSEPH W., and W. MICHAEL GOULD
1971. Further studies on the purification and physiological actions of sea nettle toxin. Proc. Soc. Exp. Biol. Med. 138(3): 759-762. (Md. JF-3-1) COM-72-11361

1971. Immunodiffusion - a technique for coelenterate polyp identification. Comp. Biochem. Physiol. 40(A): 855-857. (Md. JF-3-1) COM-72-11341

BURNETT, J.W., J.H. STONE, L.H. PIERCE, JR., D.G. CARGO, E.C. LAYNE, and J.S. SUTTON
1968. A physical and chemical study of sea nettle nematocysts and their toxin. J. Invest. Dermatol. 51: 330-336. (Md. JF-3-1) COM-72-10370

BURNETT, J.W., and J.S. SUTTON
1969. The fine structural organization of the sea nettle fishing tentacle. J. Exp. Zool. 172(3): 335-348. (Md. JF-3-1) COM-72-11189

CALDER, DALE R.
1971. Nematocysts of polyps of Aurelia, Chrysaora, and Cyanea, and their utility in identification. Trans. Amer. Micros. Soc. 90(3): 269-274. (Va. JF-3-2)

1972. Development of the sea nettle Chrysaora quinquecirrha (Scyphozoa, Semaeostomeae) Chesapeake Sci. 13(1): 40-44. (Va. JF-3-2) COM-72-11232

CALDER, DALE R., HAROLD N. CONES, and EDWIN B. JOSEPH
1971. Bibliography on the Scyphozoa with selected references on Hydrozoa and Anthozoa. Va. Inst. Mar. Sci., Spec. Sci. Rep. 59, 142 pp. (Va. JF-3-9)

CARLEY, D.H.
1968. Economic analysis of the commercial fishery industry of Georgia. Univ. Ga. Agr. Exp. Sta., Res. Bull. 37, 92 pp. (Ga. 2-46-R) COM-72-10183

1968. Factors affecting cost and income from shrimp vessels. Ga. Game Fish Comm., Contrib. 11, 14 pp. (Ga. 2-46-R) COM-72-10188

CARLEY, D.H., and C.M. FRISBIE
1968. The commercial fishing industry of Georgia--an economic evaluation. Univ. Ga. Agr. Exp. Sta., Contrib. 7, 13 pp. (Ga. 2-46-R) COM-72-10289

1968. The blue crab, oyster, and finfish fisheries of Georgia--an economic evaluation. Ga. Game Fish Comm., Contrib. 12, 14 pp. (Ga. 2-46-R) COM-72-10187

1968. The shrimp fishery of Georgia--an economic evaluation. Ga. Game Fish Comm., Contrib. 13, 15 pp. (Ga. 2-46-R) COM-72-10189

CARTER, H.H.
1967. A method of predicting brood stock requirements for oyster (V. virginica) producing areas with application to the Manokin River. Chesapeake Bay Inst., Spec. Rep. 13, 37 pp. (Md. 3-75-R) COM-72-10390

CHAI, T, C. CHEN, A. ROSEN, and R.E. LEVIN
1968. Detection and incidence of specific species of spoilable bacteria on fish. II. Relative incidence of Pseudomonas putrefaciens and fluorescent pseudomonads on haddock fillets. Appl. Microbiol. 16: 1738-1741. (Mass. 3-35-R)

CHRISTMAS, J.Y.
1969. Parasitic barnacles in Mississippi estuaries with special reference to Loxothylacus texanus boschma in the blue crab (Callinectes sapidus). SE Assoc. Game Fish Comm., Proc. 23d Ann. Conf., pp. 272-275. (Miss. 2-25-R) COM-72-10063

CHRISTMAS, J.Y., and H.D. HOWSE
1970. The occurrence of lymphocystis in Micropogon undulatus and Cynoscion arenarius from Mississippi estuaries. Gulf Coast Res. Lab., Ocean Springs, Miss. 3(1): 131-154. (Miss. 2-25-R and 2-42-R) COM-72-10052

CIANCI, JOHN M.
1969. Larval development of the alewife Alosa pseudoharengus (Wilson) and the glut herring, Alosa aestivalis (Mitchell). Rep. Univ. Conn., Storrs. (Conn. 3-45-R)

COLLINS, RICHARD A.
1971. Cage culture of catfish in reservoir lakes. SE Assoc. Game Fish Comm., Proc. 24th Ann. Conf. (1970), pp. 489-496. (Ark. 4-49-R)

COOK, DAVID W.
1970. Comparison of coliform and fecal coliform IMVIC types from polluted and unpolluted estuarine waters. Bacteriol. Proc. G 26, p. 19. (Miss. 2-28-R)

1972. A circulating seawater system for experiments studies with crabs. Prog. Fish-Cult. 34(1): 61-65. (Miss. 2-85-R) COM-72-10383

COOK, DAVID W., and RONALD E. BOWMAN
1972. Retardation of shrimp spoilage with ethylenediaminetetraacetic acid. J. Miss. Acad. Sci. 17: 38-43. (Miss. 2-61-R) COM-73-10437

COOK, DAVID W., and CARY W. CHILDERS
1968. Depuration of Biloxi Bay oysters by relaying. Gulf States Mar. Fish Comm., Min. Mar. 26, 1968, 17 pp. (Miss. 2-28-R) COM-72-11177

1970. Relationships between pollution indicators and the salinity of Mississippi's estuarine waters. Proc. Miss. Water Res. Conf. 1970, 181-191. (Miss. 2-28-R)

COOK, DAVID W., and RICHARD W. HAMILTON
1971. Factors affecting survival of pollution indicator organisms in estuarine waters. J. Miss. Acad. Sci., 29: 3-10. (Miss. 2-28-R) COM-72-10426

CRANCE, JOHNIE H.
1969. A selected bibliography of Alabama estuaries. Ala. Mar. Res. Lab., Dauphin Island, Ala., Res. Bull. 2, 21 pp. (Ala. 2-34-R) COM-72-10302

1971. Description of Alabama estuarine areas - cooperative Gulf of Mexico estuarine inventory. Ala. Mar. Res. Lab., Dauphin Island, Ala., Res. Bull. 6, 85 pp. (Ala. 2-34-R) COM-72-10283

CRAWFORD, LADELL, ENID J. IRWIN, JOHN SPINELLI, and W.D. BROWN
1970. Premortem stress and postmortem biochemical changes in skipjack tuna and their relation to quality of the canned product. J. Food Sci. 35: 849-851. (P.R. 2-104-R) COM-73-10849

CRAWFORD, D.L., and D.K. LAW
1972. Shelf life stability and acceptance of frozen Pacific hake (Merluccius productus) fillet portions. J. Food Sci. 37: 801-802. (Oreg. 1-59-D)

CREASER, EDWIN P., JR.
1971. An interstitial water-sampling receptacle for intertidal mud flats. J. Fish. Res. Bd. Can. 28: 1049-1051. (Me. 3-16-R) COM-73-50444

DAMMAN, ARTHUR E.
1969. Study of the fisheries potential of the Virgin Islands. Ecol. Res. Sta., Spec. Rep. Contrib. 1(1-2): 1-205. (Virgin Is. 2-33-R) COM-72-10043

DAMMAN, ARTHUR E., J.A. YNTEMA, W.N. BROWNELL, and A.A. SPANDORX
1970. Exploratory fishing for a source of non-ciguatoxic sport and food fish. Ecol. Res. Sta., Spec. Rep. Contrib. 2, 48 pp. (Virgin Is. 2-96-R) COM-71-01131

DAVIS, ALLEN S.
1967. Forecast research on 1967 Cook Inlet area pink salmon fisheries. Alaska Dep. Fish Game, Leafl. 98, 13 pp. (Alaska 5-4-R)

1968. Forecast research on 1968 Cook Inlet area pink salmon fisheries. Alaska Dep. Fish Game, Leafl. 117, 13 pp. (Alaska 5-4-R) COM-73-10081

1968. Salmon counting by acoustic means. Alaska Dep. Fish Game, Leafl. 113, 28 pp. (Alaska 5-6-R) COM-73-10799

1970. Forecast research on 1970 Cook Inlet area pink salmon fisheries. Alaska Dep. Fish Game, Leafl. 143, 17 pp. (Alaska 5-4-R) COM-73-10100

DEMORY, ROBERT L.
1971. Depth distribution of some small flatfishes off the northern Oregon-southern Washington coast. Fish Comm. Oreg., 3: 44-48. (Oreg. 1-4-R) COM-72-11065

DEYOE, C.W., and O.W. TIEMEIER
1968. Nutritional requirements for channel catfish fingerlings. Feedstuffs 40(45): 48-51. (Kans 4-1-R) COM-72-10240

DEYOE, C.E., O.W. TIEMEIER, and C. SUPPES
1968. Effects of protein, amino acid levels, and feeding methods on growth of fingerling channel catfish. Prog. Fish-Cult. 30: 187-195. (Kans 4-1-R) COM-72-10184

DIAS, ROBERT K., JAMES K. DIAS, and WILLIAM D. ANDERSON, JR.
1972. Relationships of lengths (standard, fork, and total) and lengths to weight in the red porgy, Pagrus sedecim (Perciformes, Sparidae), caught off South Carolina. Trans. Amer. Fish. Soc. 101(3): 503-506. (S.C. 2-110-R)

DURLEY, KENNETH E., and MELVIN C. SEIBEL
1972. Forecast of the 1972 pink salmon runs, southeastern Alaska. Alaska Dep. Fish Game, Leafl. 158, 39 pp. (Alaska AFC-42) COM-73-10803

EATON, MARTIN F.
1967. Frazer Lake sockeye investigations, 1966. Alaska Dep. Fish Game, Leafl. 99, 48 pp. (Alaska AFC-8) COM-73-10751

1968. Frazer Lake sockeye investigations, 1967. Alaska Dep. Fish Game, Leafl. 119, 45 pp. (Alaska AFC-8)

EDFELT, LARRY B.
1970. Forecast research on 1970 Cook Inlet area pink salmon fisheries. Alaska Dep. Fish Game, Leafl. 141, 14 pp. (Alaska 5-4-R) COM-73-10091

ELEUTERIUS, CHARLES K.
1970. Development of a mathematical model to predict the occurrence of Cynoscion arenarius in Mississippi estuaries. M.S. thesis, Univ. S. Miss., Hattiesburg, 38 pp. (Miss. 2-25-R) COM-72-11197

ELEUTERIUS, CHARLES K., and J.Y. CHRISTMAS
1967. The development of a toxonomic code and design of a system for the analysis of biological data. SE Assoc. Game Fish Comm., Proc. 21st Ann. Conf., 5 pp. (Miss. 2-25-R)

ELEUTERIUS, LIONEL N.
1970. Observations on Claviceps purpurea and Spartina alternaflora in the coastal marshes of Mississippi. Gulf Coast Res. Lab., Ocean Springs, Miss. 3(1): 105-109. (Miss. 2-25-R) COM-72-10962

ESPINOSA, F.A., JR., JAMES E. DEACON, and ANDRE SIMMONS
1970. An economic and biostatistical analysis of the bait fish industry in the lower Colorado River. Univ. Nev., Spec. Pub., 87 pp. (Nev. 6-9-D) COM-72-10082

EVENHUIS, BERNARD LEE
1970. Seasonal and daily food habits of goldeye, Hiodon alosides (Rafinesque), in the Little Missouri Arm of Lake Sakakawea, North Dakota. M.S. thesis, Univ. N. Dak., Grand Forks, 42 pp. (N. Dak. 4-15-R) COM-72-11158

FLICKINGER, STEPHEN A.
1969. Increasing fathead minnow production through population manipulation. Ph.D. thesis, Colo. St. Univ., Fort Collins, 65 pp. (Colo. 6-2-D) COM-72-10254

1969. Determination of sexes in the fathead minnow. Trans. Amer. Fish Soc. 98(3): 526-527. (Colo. 6-2-D)

1970. Pond culture of bait fishes. Coop. Ext. Serv. Colo. St. Univ., Bull. 478A, 39 pp. (Colo. 6-2-D) COM-72-10054

FRANCIS, ROBERT COLGATE
1970. Simulation and estimation of movement in a stratified population subject to recruitment and emigration. Ph.D. thesis, Univ. Wash., Seattle, 325 pp. (Alaska AFC-15)

FRANKS, JAMES S., J.Y. CHRISTMAS, WALTER L. SILER, RALPH COMBS, RICHARD WALKER, and CHARLES BURNS
1972. A study of nektonic and benthic faunas of the shallow Gulf of Mexico off the State of Mississippi. Gulf Coast Res. Lab. 4(1): 1-148. (Miss. 2-42-R)

FRISBIE, CHARLES M.
1967. Preliminary studies of the seasonal abundance and biological stability of the commercial shrimp of Georgia. Ga. Game Fish Comm., Contrib. 4, 19 pp. (Ga. 2-43-R) COM-72-10347

FUJIMURA, TAKUJI
1966. Notes on the development of a practical mass culturing technique of the giant prawn Macrobrachium rosenbergi. 12th Session, Indo-Pacific Fish Council, C66/WP47, Div. Fish Game, Hawaii, 4 pp., mimeo. (Hawaii H-1-D)

FUJIMURA, T., and H. OKAMOTO
1970. Notes on progress made in developing a mass culturing technique for Macrobrachium rosenbergi in Hawaii. 14th Session, Indo-Pacific Fish Council, C70/SYM 53, Div. Fish Game, Hawaii, 10 pp., mimeo. (Hawaii H-14-D)

GAMMON, RONALD LESTER
1970. The gross and microanatomy of the digestive tract and pancreas of the channel catfish, Ictalurus punctatus. M.S. thesis, Kans. St. Univ., Manhattan, 52 pp. (Kans. 4-45-R) COM-72-10177

GARWOOD, GORDON P.
1967. Notes on the life histories of the silversides, Menidia beryllina (Cope) and Membras martinica (Valenciennes), in Mississippi Sound and adjacent waters. SE Assoc. Game Fish Comm., Proc. 21st Ann. Conf., 14 pp. (Miss. 2-25-R)

GODCHARLES, MARK F.
1971. A study of the effects of a commercial hydraulic clam dredge on benthic communities in estuarine areas. Fla. Dep. Natur. Res., Tech. Serv. 64, 51 pp. (Fla. 2-53-R) COM-72-10109

GODWIN, WALTER F.
1967. Preliminary survey of a potential hard clam fishery. Ga. Game Fish Comm., Contrib. 1, 23 pp. (Ga. 2-44-R) COM-72-10320

1967. Preliminary study of the shad fishery of the Altamaha River, Georgia. Ga. Game Fish Comm., Contrib. 2, 24 pp. (Ga. AFC-1) COM-72-10193

1968. The shad fishery of the Altamaha River, Georgia. Ga. Game Fish Comm., Contrib. 8, 39 pp. (Ga. AFC-1) COM-72-10192

1968. The distribution and density of the hard clam, Mercenaria mercenaria, on the Georgia coast. Ga. Game Fish Comm., Contrib. 10, 30 pp. (Ga. 2-44-R) COM-72-10319

1968. The distribution and density of the brackish water clam, Rangia cuneata, in the Altamaha River, Georgia. Ga. Game Fish Comm., Contrib. 5, 11 pp. (Ga. 2-44-R) COM-72-10194

1968. The growth and survival of planted clams, Mercenaria mercenaria, on the Georgia coast. Ga. Game Fish Comm., Contrib. 9, 16 pp. (Ga. 2-44-R) COM-72-10318

GODWIN, WALTER F., and JOHN G. ADAMS
1969. Young clupeids of the Altamaha River, Georgia. Ga. Game Fish Comm., Art. 15, 30 pp. (Ga. AFC-6) COM-72-10181

GODWIN, WALTER F., and L. GLENN MCBAY
1967. Preliminary studies of the shad fishery of the Altamaha River, Georgia. Ga. Game Fish Comm., Contrib. 2, 24 pp. (Ga. AFC-1) COM-72-10193

GODWIN, W.F., M.W. STREET, and T.R. RICHMAN
1971. History and status of North Carolina's marine fisheries. N.C. Dep. Conserv. Develop. Infor. Serv. 2, 77 pp. (N.C. 2-139-R) COM-72-10083

1971. Problems, priorities, and research needs of North Carolina's marine fisheries. N.C. Dep. Conserv. Develop. Infor. Serv. 3, 41 pp. (N.C. 2-139-R) COM-72-10084

GODWIN, WALTER F., and THOMAS L. VAUGHN
1968. An adult pugheaded American shad, Alosa sapidissima. Trans. Amer. Fish. Soc. 97(1): 50. (Ga. AFC-1) COM-72-10066

GOLDNER, RONALD, JOSEPH W. BURNETT, JOHN S. STONE, and MOUTA S. DILAIMY
1969. The chemical composition of sea nettle nematocyst. Proc. Exp. Biol. Med. 131: 1386-1388. (Md. JF-3-1) COM-72-10394

GOULD, W. MICHAEL, and JOSEPH W. BURNETT
1971. Effects of Chrysaora quinquecirrha (sea nettle) toxin on sodium transport across frog skin. J. Invest. Dermatol. 57(4): 266-268. (Md. JF-3-1) COM-72-11233

GRINSTEAD, BOBBY G., and RICARDO GOMEZ
1972. Catch of commercial and game fish with four-foot trap nets of various mesh size. Contrib. 184, Okla. Fish. Res. Lab., 26th Ann. Conf. SE Assoc. Game Fish Comm., 13 pp. (Okla. 2-154-R)

GUNDERSON, DONALD R.
1970. A note on techniques and intensity required for Pacific ocean perch catch sampling. Fish. Res. Pap., Wash. Dep. Fish. 3(2): 29-35. (Wash. 1-70-R)

1970. Reproductive patterns of Pacific ocean perch (Sebastodes alutus) off Washington and British Columbia and their relation to bathymetric distribution and seasonal abundance. J. Fish. Res. Bd. Can. 28: 417-425. (Wash. 1-70-R) COM-72-11092

GWARTNEY, LOUIS A.
1969. Frazer Lake sockeye investigations, 1968. Alaska Dep. Fish Game, Leafl. 129, 23 pp. (Alaska AFC-8)

HAGER, ROBERT D., and EARLE D. JEWELL
1968. Field evaluation of coded wire tag detection and recovery techniques. Wash. Dep. Fish., Fish. Res. Pap. 20 pp. (Wash. 1-30-R) COM-72-11268

HAHN, DOUGLAS R.
1972. Cage culture of black bullheads, Ictalurus melas (Rafinesque) in North Dakota. M.S. thesis, Univ. N. Dak., Grand Forks, 67 pp. COM-72-11169

HALL, JAMES D., and RICHARD A. LANTZ
1969. Effects of logging on the habitat of coho salmon and cutthroat trout in coastal streams. Tech. Pap. 2570, Oreg. Agr. Sta., Oreg. St. Univ., pp. 355-375. (Oreg. AFC-23) COM-72-11089

HALLOCK, RICHARD J., ROBERT F. ELWELL, and DONALD H. FRY, JR.
1970. Migration of adult king salmon Oncorhynchus tshawytscha in the San Joaquin Delta as demonstrated by the use of sonic tags. Calif. Fish Game, Fish Bull. 151, 92 pp. (Calif. AFC-8) COM-72-10775

HEINO, BECKERT, DONALD G. BLAND, and EDWIN B. MAY
1972. The incidence of Labyrinthomyxa marina in Alabama. Ala. Mar. Res. Bull. 8, pp. 18-33. (Ala. 2-34-R) COM-72-11148

HENNICK, DANIEL P.
1967. Forecast research on 1967 Kodiak area pink salmon fisheries. Alaska Dep. Fish Game, Leafl. 100, 22 pp. (Alaska 5-4-R)

1970. Reproductive cycle, size at maturity, and sexual composition of commercially harvested weathervane scallops (Patinopecten caurinus) in Alaska. J. Fish. Res. Bd. Can. 27: 2112-2119. (Alaska 5-23-R) COM-72-11048

HENNICK, DANIEL P., and LARRY B. EDFELT
1968. Forecast research on 1968 Kodiak area pink salmon fishery. Alaska Dep. Fish Game, Leafl. 114, 28 pp. (Alaska 5-4-R) COM-73-10088

1969. Forecast research on 1969 Kodiak area pink salmon return. Alaska Dep. Fish Game, Leafl. 131, 18 pp. (Alaska 5-4-R) COM-73-10075

HERDENDORF, CHARLES E.
1968. Sedimentation studies in the south shore reef area of western Lake Erie. Proc. 11th Conf., Great Lakes Res., 188-205. (Ohio AFCS-1) COM-72-10091

HESSE, J.L.
1969. Distribution and growth of immature hatchery-reared lake trout, Salvelinus namaycush, in Lake Michigan. M.S. thesis, Mich. St. Univ., East Lansing. (Mich. 4-2-R) COM-72-10292

HIDU, HERBERT, KLAUS G. CROBECK, ELGIN A. DUNNINGTON, WILLIAM H. ROOSENBURG, and ROBERT L. BECKETT
1969. Oyster hatcheries for the Chesapeake Bay region. Natur. Res. Inst. Spec. Rep. 2, Contrib. 382, 18 pp., Univ. Md. (Md. 3-23-R) COM-72-10391

HIEB, R.N.
1968. Observations on the life history of the goldeye, Hiodon alosoides, (Rafinesque) in Moccasin Bay on the Little Missouri Arm, Garrison Reservoir, North Dakota. M.S. thesis, Univ. N. Dak., Grand Forks. (N. Dak. 4-15-R)

HILDEBRAND, DEAN C.
1967. A survey of the commercial fisheries on the mainstem reservoirs of the upper Missouri River system. M.S. thesis, Univ. N. Dak., Grand Forks. (N. Dak. 4-23-D)

HOESE, H. DICKSON, WALTER R. NELSON, and BECKERT HEINO
1972. Seasonal and spatial setting of fouling organisms in Mobile Bay and Eastern Mississippi Sound, Alabama. Ala. Mar. Res. Bull. 8, pp. 9-17. (Ala. 2-34-R)

HOGMAN, WALTER J.
1970. A computer program for stock analysis in FORTRAN IV, Univac 1108. Trans. Amer. Fish. Soc. 99(2): 426-427. (Wis. AFC-6)

HOLMSEN, ANDREAS
1967. Comparative testing of midwater rings of small draggers. Dep. Food Res. Econ., Coll. Agr., Univ. R.I., Pap. 67-90, 28 pp. (R.I. 3-53-R)

1968. The commercial potential of the deep sea red crab. Dep. Food Res. Econ., Coll. Agr., Univ. R.I., Pap. 68-138, 17 pp. (R.I. 3-43-R)

INIGO, FELIX, and ROLF JUHL
1967. Outlook of Puerto Rico's commercial fisheries development. Gulf Carib. Fish. Inst. Proc. 20th Ann. Ses., pp. 128-132. (P.R. 2-37-S) COM-72-10061

JACKSON, PETER B.
1968. Development and growth of the Kodiak Island shrimp fishery. Alaska Dep. Fish Game, Leafl. 120, 16 pp. (Alaska 5-9-R) COM-73-10752

JEARLD, A.
1970. Fecundity, food habits, age and growth, length-weight relationships and condition of channel catfish, Ictalurus punctatus (Rafinesque), in a 3300-acre turbid Oklahoma reservoir. M.S. thesis, Okla. St. Univ., Stillwater. (Okla. 4-24-R) COM-72-10180

JENNINGS, DARYL EUGENE
1969. Evaluation of introduction of walleye, Stizostedion vitreum (Mitchell), in Elephant Butte Lake, New Mexico. M.S. thesis, N. Mex. St. Univ., Las Cruces, 39 pp. (N. Mex. 6-11-R) COM-72-10031

JENSEN, BUDDY LEE
1971. Life history and ecology of gizzard shad, Dorosoma cepedianum (LeSueur), with Elephant Butte Lake, New Mexico. M.S. thesis, N. Mex. St. Univ., 107 pp. (N. Mex. 6-11-R) COM-72-11293

JESTER, DOUGLAS B.
1971. Age-growth, length-weight, condition, and survival of river carpsucker, Carpiodes carpio (Rafinesque), in Elephant Butte Lake, New Mexico. Ph.D. thesis, Colo. St. Univ., Fort Collins, 100 pp. (N. Mex. 6-11-R) COM-72-10058

1971. Effects of commercial fishing, species introductions, and drawdown control on fish populations in Elephant Butte Reservoir, New Mexico. In: Reservoir Fisheries and Limnology (Ed. Gordon E. Hall), Trans. Amer. Fish Soc., Spec. Pub. 8, pp. 265-285. (N. Mex. 6-11-R) COM-73-10733

1972. Life history, ecology, and management of the river carpsucker, Carpiodes carpio (Rafinesque), with reference to Elephant Butte Lake. N. Mex. St. Univ., Agr. Exp. Sta. Res. Rep. 243, 120 pp. (N. Mex. 6-11-R) COM-73-10409

JESTER, DOUGLAS B., and BUDDY L. JENSEN
1972. Life history and ecology of the gizzard shad Dorosoma cepedianum (LeSueur) with reference to Elephant Butte Lake. N. Mex. St. Univ., Agr. Exp. Sta. Res. Rep. 218, 56 pp. (N. Mex. 6-11-R) COM-72-10409

JESTER, D.B., R.R. PATTERSON, D.E. JENNINGS, T.M. MOODY, and C. SANCHEZ, JR.
1970. Effects of color of gill nets on catch rates of fishes. Agr. Exp. Sta. Bull. 564, N. Mex. St. Univ., Las Cruces, 16 pp. (N. Mex. 6-11-R) COM-71-01129

JOHNSON, JAMES E.
1968. Albinistic carp, Cyprinus carpio, from Roosevelt Lake, Arizona. Trans. Amer. Fish. Soc. 97(2): 209-210. (Ariz. 6-1-R) COM-72-10246

1970. Age, growth, and population dynamics of threadfin shad, Dorosoma petenense (Gunther), in central Arizona reservoirs. Trans. Amer. Fish. Soc. 99(4): 739-753. (Ariz. 6-1-R) COM-72-10281

1971. Maturity and fecundity of threadfin shad, Dorosoma petenense (Gunther), in central Arizona reservoirs. Trans. Amer. Fish. Soc. 100(1): 74-85. (Ariz. 6-1-R)

JOHNSON, JAMES E., JOHN N. RINNE, and W.L. MINCKLEY
1970. Selectivity and efficiency of some commercial fishing devices in central Arizona reservoirs. Ariz. Acad. Sci. 6: 46-50. (Ariz. 6-1-R) COM-72-10321

JUHL, ROLF
1969. Exploratory fishing surveys and gear tests in Puerto Rico. P.R. Dep. Agr. Contrib. Agropecuorias Pesqueria 1(1): 1-39. (P.R. 2-39-R) COM-72-10030

1970. Ocean currents: their ways, whens, and hows. P.R. Dep. Agr. 2(2): 16. (P.R. 2-37-S) COM-71-01132

JUHL, ROLF, and JOSE A. SUAREZ-CAABRO
1971. The status of fisheries of Puerto Rico, 1970. Dep. Agr., Cont. Serv. Aux. Oper. Centr., 3(1): 1-32. (P.R. 2-56-R) COM-72-10038

1972. Status of fisheries in Puerto Rico, 1971. P.R. Dep. Agr. 4(1): 1-52. (P.R. 2-56-R) COM-73-10421

JUHL, ROLF, MARTIN R. BARTLETT, and BRUCE W. MAGHAM
1970. Exploratory fishing in the western tropical Atlantic by the tuna seiners Normandy and Queen Mary. P.R. Dep. Agr. 1(4): 16, San Juan, P.R. (P.R. 2-70-R) COM-72-10040

KAMI, HARRY T., ISAAC I. IKEHARA, and FRANCISCO P. DELEON
1968. Check-list of Guam fishes. Micronesia 4: 95-131. (Guam H-7-D)

KEITH, W.J., and H.S. COCHRAN, JR.
1968. Charting of subtidal oyster beds and experimental planting of seed oysters in South Carolina. Bears Bluff Lab., Contrib. 48, 19 pp. (S.C. 2-2-R) COM-72-10033

KENNEDY, FRANK S., JR.
1972. Distribution and abundance of Physalia in Florida waters. Prof. Papers Ser. 18, Fla. Dep. Nat. Res., 38 pp. (Fla. JF-2-2) COM-72-11275

KERBY, JEROME HOWARD, V.G. BURRELL, JR., and C.E. RICHARDS
1971. Occurrence and growth of striped bass X white bass hybrids in the Rappahannock River, Virginia. Trans. Amer. Fish. Soc. 100(4): 787-790. (Va. AFC-7)

KIMURA, MAKATO, and C.E. BLUNT, JR.
1971. Age composition of sardine landings on the Pacific Coast of the United States and Mexico in 1964-1965. Calif. Fish Game 57(2): 107-112. (Calif. 6-3-R)

KING, B.D., III
1971. Study of migratory patterns of fish and shellfish through a natural pass. Tex. Parks Wildl. Dep., Tech. Ser. 9, 54 pp. (Tex. 2-55-R) COM-72-10407

KISSIL, GEORGE
1968. A contribution of the life history of Alosa pseudoharengus (Wilson). M.S. thesis, Univ. Conn., Storrs. (Conn. 3-45-R)

1969. A study of the alewife Alosa pseudoharengus (Wilson) in Connecticut waters. Ph.D. thesis, Univ. Conn., Storrs. (Conn. 3-45-R)

KNAGGS, ERIC H.
1972. Southern California Pacific mackerel fishery and age composition of commercial landings during the 1968-69 and 1969-70 seasons. Calif. Fish Game 58(2): 116-120. (Calif. 6-3-R)

1972. San Pedro wetfish fleet: Major purse-seine gear changes, 1952-1972. U.S. Comm. Fish. Rev. 34(5-6): 11-32. (Calif. 6-3-R)

KNOWLTON, CLIFFORD J.
1972. Fishes taken during commercial shrimp fishing in Georgia's close inshore ocean waters. Ga. Game Fish Div., Centr. Ser. 21, 42 pp. (Ga. 2-87-R) COM-73-10418

KORSEHGEN, BERNICE M., RUTH E. BALDWIN, and JOHN W. ROBINSON
1970. Influence of environment on palatability of carp. J. Food Sci. 35: 425-428. (Mo. 4-34-D) COM-72-10068

LAMBERT, M.A.
1970. Variation in the level of certain blood constituents of channel catfish, Ictalurus punctatus. Ph.D. thesis, Kans. St. Univ., Manhattan. (Kans. 4-45-R) COM-72-10186

LEA, ROBERT N.
1972. Southern geographical records for four surfperches, family Embiotocidae with notes on a population resurgence of the sharpnose seaperch. Calif. Fish Game 58(1): 27-31. (Calif. 6-3-R) COM-72-10460

LECHNER, JACK
1969. Identification of red salmon stocks taken in the Cape Kumlik-Aniakchak Bay fishery, Chignik area, 1967. Alaska Dep. Fish Game, Leafl. 133, 32 pp. (Alaska AFC-9) COM-71-01128

LEGGETT, WILLIAM C., and ROBERT A. JONES
1971. Net avoidance behavior in American shad (Alosa sapidissima) as observed by ultrasonic tracking techniques. J. Fish. Res. Bd. Can. 282(8): 1167-1171. (Conn. AFC-1) COM-72-11362

LELAND, JOHN G., II
1968. Survey of the sturgeon fishery of South Carolina. Bears Bluff Lab., Contrib. 47, 34 pp. (S.C. AFC-1) COM-72-10034

LEVIN, R.E.
1968. Detection and incidence of specific species of spoilage bacteria on fish. Appl. Micro. Biol. I. Methodol., 16: 1734-1737. (Mass. 3-35-R)

LEWIS, SUE D.
1968. Myxobolus argenteus sp. N. (Protozoa: Mysoxporida), a parasite of the golden shiner. J. Parasitol. 54: 1034-1037. (Ill. 4-32-R) COM-72-11181

1971. Effect of selected concentrations of sodium chloride on the growth of channel catfish. SE Assoc. Game Fish Comm., Proc. 25th Ann. Conf., pp. 459-466. (Ill. 4-50-R)

LEWIS, SUE D., and WILLIAM M. LEWIS
1971. The effect of zinc and copper on the osmolality of blood serum of the channel catfish, Ictalurus punctatus Rafinesque, and golden shiner, Notemigonus crysoleucas Mitchell. Trans. Amer. Fish. Soc. 100(4): 639-643. (Ill. 4-50-R) COM-73-10723

LINDSAY, CEDRIC E.
1967. Potential sources of Pacific oyster seed in Korea and Taiwan. Wash. Dep. Fish., 52 pp. (Wash. 1-24-D) COM-72-10556

LINTON, THOMAS L.
1968. Proceedings of the Oyster Culture Workshop. Ga. Game Fish Comm., Mar. Fish Div., Contrib. 6, 83 pp. (Ga. 2-10-R) COM-72-10191

LOEFFEL, ROBERT E., and WILLIAM O. FORSTER
1970. Determination of movement and identity of stocks of coho salmon in the ocean using the radionuclide Zinc-65. Rep. Fish Comm. Oreg. 2(1): 1-13 (Oreg. AFC-19)

LOESCH, JOSEPH
1968. A contribution to the life history of Alosa aestivalis (Mitchell). M.S. thesis, Univ. Conn., Storrs. (Conn. 3-45-R)

1969. A study of the blueback herring, Alosa aestivalis (Mitchell), in Connecticut waters. Ph.D. thesis, Univ. Conn., Storrs. (Conn. 3-45-R)

LUND, WILLIAM A., JR., and LANCE L. STEWART
1970. Abundance and distribution of larval lobsters, Homarus americanus, off the coast of Southern New England. Proc. Nat. Shell. Assoc. 60: 40-49. (Conn. 3-44-R)

LUND, WILLIAM A., JR., and RUSSELL C. LOCKWOOD, JR.
1970. Sonic tags for large decapod crustaceans. J. Fish. Res. Bd. Can. 27: 1147-1151. (Conn. 3-44-R) COM-72-11167

MADSEN, MONTE L.
1971. The presence of nuptial tubercles on female quillback (Carpiodes cyprinus). Trans. Amer. Fish. 100(1): 132-134. (Nebr. 4-4-R and 4-57-R) COM-71-01130

MAHOOD, ROBERT K., MICHAEL D. MCKENZIE, DOUGLAS P. MIDDAUGH, SEAN J. BOLLAR, JOHN R. DAVIS, and DENNIS SPITSBURGEN
1970. A report on the cooperative blue crab study - South Atlantic States. Ga. Fish Game Comm. Contrib. 19; Fla. Dep. Nat. Res. Contrib. 139; and N.C. Div. Comm. Sports Fish. Spec. Sci. Rep. 18, 32 pp. (Fla. 2-81-R, Ga.2-82-R, N.C. 2-80-R, and S.C. 2-79-R) COM-72-10039

MANAR, THOMAS A. (Editor)
1966. Proceedings of the Governors Conference on Central Pacific fishery resources. State of Hawaii, Honolulu, 266 pp. (Hawaii H-9-R) COM-72-10071

MARCY, BARTON C., JR.
1969. Age determination from scales of Alosa pseudoharengus (Wilson) and Alosa aestivalis (Mitchell) in Connecticut waters. Trans. Amer. Fish. Soc. 98(4): 622-630. (Conn. 3-45-R)

MARSHALL, HOWARD L.
1969. Development and evaluation of new cultch materials and techniques for three-dimensional oyster culture. N.C. Dep. Conserv. Develop., Spec. Sci. Rep. 17. 35 pp. (N.C. 2-6-R) COM-72-10257

MAURER, DON, LES WATLING, and RICHARD KECK
1971. The Delaware oyster industry: A reality? Trans. Amer. Fish. Soc. 100(1): 100-111. (Del. 3-55-R)

MAY, EDWIN B.
1969. Feasibility of off bottom oyster culture in Alabama. Ala. Mar. Res. Bull. 3, 14 pp. (Ala. 2-18-R) COM-72-10255

1971. A survey of the oyster and oyster shell resources of Alabama. Ala. Mar. Res. Bull. 4, 53 pp. (Ala. 2-34-R) COM-72-10012

MAY, EDWIN B., and KENNETH R. MCLAIN
1970. Advantages of electronic positioning and profiling in surveying buried oyster shell deposits. Proc. Nat. Shell. Assoc. 60: 72-74. (Ala. 2-34-R) COM-72-10029

MAYHEW, JAMES K.
1969. Age and growth of flathead catfish in the Des Moines River, Iowa. Trans. Amer. Fish. Soc. 98(1): 118-121. (Iowa 4-11-R) COM-72-10062

1971. Intra-stream movement and distribution of channel catfish. Proc. Iowa Acad. Sci. 78(1): 30-33. (Iowa 4-11-R) COM-72-10114

1972. Some biological characteristics of a channel catfish population in the lower Des Moines River with an evaluation of potential commercial harvest. Iowa State Conserv. Comm., Tech. Ser. 72-2, 49 pp. (Iowa 4-11-R) COM-72-10808

MCCOY, EDWARD G.
1968. Migration, growth, and mortality of North Carolina pink and brown shrimps. N.C. Dep. Conserv. Develop., Spec. Sci. Rep. 15, 26 pp. (N.C. 2-26-R) COM-72-10095

MCCOY, EDWARD G., and JAMES T. BROWN
1967. Migration and growth of commercial penaeid shrimps in North Carolina. N.C. Dep. Conserv. Develop., Spec. Sci. Rep. 11, 29 pp. (N.C. 2-26-R) COM-72-10288

1972. Dynamics of North Carolina shrimp populations. N.C. Dep. Nat. Econ. Res., Spec. Sci. Rep. 21, 53 pp. (N.C. 2-26-R)

MCCRARY, JERRY A.
1971. Sternal spines as a characteristic for differentiating between females of some Pandalidae. J. Fish. Res. Bd. Can. 28(1): 98-100. (Alaska 5-20-R)

MCCURDY, MICHAEL L.
1969. 1968 Bristol Bay sockeye salmon smolt studies. Alaska Dep. Fish Game, Leafl. 138, 95 pp. (Alaska 5-5-R) COM-73-10691

MCGUIRE, JOHN W.
1969. Growth and food habits of supplementally fed and unfed young-of-the-year channel catfish (Ictalurus punctatus) held in two plastic-lined ponds. M.S. thesis. Kans. St. Univ., Manhattan. (Kans. 4-1-R) COM-72-10172

MCILWAIN, THOMAS D.
1967. Distribution of the striped bass, Roccus saxatilis (Walbaum) in Mississippi waters. SE Assoc. Game Fish Comm., Proc. 21st Ann. Conf., pp. 254-257. (Miss. AFCS-1) COM-72-11159

MCKENZIE, MICHAEL D.
1970. Fluctuations in abundance of the blue crab and factors affecting mortalities. S.C. Wildl. Res. Dep., Mar. Res. Div., Tech. Rep. 1, 45 pp. (S.C. 2-79-R) COM-72-10094

MCKENZIE, MICHAEL D., and ALSTON C. BADGER
1969. A systematic survey of intertidal oysters in the Savannah River Basin area of South Carolina. Bears Bluff Lab., Contrib. 50, 15 pp. (S.C. 2-2-R) COM-72-11059

MCMULLEN, JOHN C.
1967. Breeding king crabs Paralithodes camtschatica located in ocean environments. Fish. Res. Bd. Can. 24(12): 2627-2628. (Alaska 5-11-R) COM-72-10397

1967. King crab Paralithodes camtschatica (Tilesius) offshore breeding study on Marmot Flats, Kodiak Island, spring of 1967. Alaska Dep. Fish Game, Leafl. 112, 12 pp. (Alaska 5-11-R) COM-73-10004

MCMULLEN, JOHN C.
1968. Investigation of king crab ocean reproduction and brood stock composition, Kodiak Island. Alaska Dep. Fish Game, Leafl. 126, 16 pp. (Alaska 5-11-R)

1969. Effects of delayed mating on the reproduction of king crab, Paralithodes camtschatica. Fish. Res. Bd. Can. 26(1): 4 pp. (Alaska 5-11-R) COM-72-10396

1970. Aspects of early development and attachment of fertilized king crab eggs. Alaska Dep. Fish Game, Leafl. 140, 12 pp. (Alaska 5-11-R) COM-73-10753

MCMULLEN, JOHN C., and HARVEY T. YOSHIHARA
1969. Fate of unfertilized eggs in king crabs, Paralithodes camtschatica (Tilesius). Alaska Dep. Fish Game, Leafl. 127, 14 pp. (Alaska 5-11-R) COM-73-10071

1971. Deposition of mature eggs in unmated king crabs, Paralithodes camtschatica (Tilesius). Trans. Amer. Fish. Soc. 100(3): 583-584. (Alaska 5-11-R) COM-72-11057

MELARAGNO, HELEN PAULINE
1970. Variations in levels of certain enzymes of glucose metabolism in the liver of the channel catfish, Ictalurus punctatus. Ph.D. thesis, Kans. St. Univ., Manhattan, 87 pp. (Kans. 4-45-R) COM-72-10261

MENSINGER, GARY, and BRADFORD E. BROWN
1968. Live weight-dressed weight relationship for commercial fisheries from four Oklahoma reservoirs. SE Assoc. Game Fish Comm., Proc. 22d Ann. Conf., 465-470. (Okla. 4-25-R) COM-72-10067

MESHAW, JOHN CARDON, JR.
1970. A study of feeding selectivity of striped bass fry and fingerlings in relation to zooplankton availability. M.S. thesis, N.C. St. Univ., Raleigh, 58 pp. (N.C. AFC-4) COM-72-10291

MESINGER, GARY C.
1972. Commercial harvest of mussels in Oklahoma 1966-71. Proc. Okla. Acad. Sci. 52: 150-152. (Okla. 2-154-R)

MEYER, E.R.
1968. Distribution and abundance of freshwater mussels of the family Unioidae of the Wabash, White, and East Fork of the White Rivers of Indiana. M.S. thesis, Univ. of Louisville, Louisville. (Ind. 4-10-R) COM-72-10260

MEYER, F.P., D.L. GRAY, W.P. MATHIS, J.M. MARTIN, and B.R. WELLS
1967. Production and returns from the commercial production of fish in Arkansas during 1966. SE Assoc. Game Fish Comm., Proc. 18th Ann. Conf., 525-531. (Ark. 4-12-R) COM-72-11274

MILLER, DONALD EUGENE
1970. A comparison of biological characteristics of goldeye, Hiodon alosides (Rafinesque), in Garrison Reservoir. M.S. thesis, Univ., N. Dak., Grand Forks, 77 pp. (N. Dak. 4-15-R) COM-72-11164

MILLIKAN, A.E.
1970. The Puget Sound hake fishery: past, present, future. Wash. Dep. Fish., Tech. Rep. 5, 15 pp. (Wash. 1-71-R) COM-72-11062

MILLIKAN, A.E., and B.H. PATTIE
1970. Hermaphroditism in a Pacific hake, Merluccius productus from Puget Sound, Washington. J. Fish. Res. Bd. Can. 27(2): 409-410. (Wash. 1-39-D) COM-72-10548

MINCKLEY, W.L.
1970. Keys to native and introduced fishes of Arizona. Ariz. Acad. Sci. 6: 183-188. (Ariz. 6-1-R) COM-72-10279

MINCKLEY, W.L., JAMES E. JOHNSON, JOHN N. RINNE, and SANDRA E. WILLOUGHBY
1970. Foods of buffalofishes, Genus Ictiobus, in central Arizona reservoirs. Trans. Amer. Fish. Soc. 99(2): 333-342. (Ariz. 6-11-R)

MITZNER, LARRY
1969. Accidental mortality of crappie in pound nets fished for rough fish species. Proc. Iowa Acad. Sci. 76: 211-216. (Iowa 4-11-R) COM-72-10036

1971. Movement of bigmouth buffalo in Coralville Reservoir, Iowa. Proc. Iowa Acad. Sci. 78. (Iowa 4-11-R) COM-72-10113

MOFFETT, A.W.
1970. The shrimp fishery in Texas. Tex. Parks Wildl., Dep. Bull. 50, 38 pp. (Tex. 2-62-D)

MOODY, THOMAS MONROE
1970. Effects of commercial fishing on the population of smallmouth buffalo, Ictiobus bubalus (Rafinesque), in Elephant Butte Lake, New Mexico. M.S. thesis, N. Mex. St. Univ., State College, 29 pp. (N. Mex. 6-11-R) COM-72-10047

NELSON, D.C., and L.G. BLAUFUSS
1968. An economic analysis of existing markets for commercial fish from the upper midwest. Agr. Econ. Rep. 59, N. Dak. St. Univ., 41 pp. (N. Dak. 4-40-D)

NELSON, RICHARD E.
1971. 1967 Alaska catch and production. Commer. Fish. Statis., Alaska Dep. Fish. Game Leafl. 15, 29 pp. (Alaska 5-3-D) COM-72-11389

1972. 1968 Alaska catch and production. Commer. Fish. Statis., Alaska Dep. Fish. Game Leafl. 17, 29 pp. (Alaska 5-3-D) COM-72-10463

NORTON, J.L.
1968. The distribution, character, and abundance of sediments in a 3,000 acre impoundment in Payne County, Oklahoma. M.S. thesis, Okla. St. Univ., Stillwater. (Okla. 4-24-R) COM-72-10182

NUCKLES, L.D.
1967. Aboard the Western Gulf. Tex. Parks Wildl. 25(7): 2-4. (Tex. 2-13-C)

OVERSTREET, ROBIN M.
1970. Two new species of Digenea from the spot, Leiostomus zanthurus, Lacepede, from the Gulf of Mexico. J. Parasitol. 56(6): 1055-1057. (Miss. 2-85-R) COM-72-10076

1971. Neochasmus sogandaresi N. Sp. (Trematoda: Cryptogonimidae) from the striped bass in Mississippi. Trans. Amer. Microsc. Soc. 90(1): 87-89. (Miss. AFCS-1) COM-72-10073

1971. Some adult digenetic trematodes in striped mullet from the northern Gulf of Mexico. J. Parasitol. 57(5): 967-974. (Miss. 2-85-R) COM-72-10098

1971. Metadena spectanda Travassos, Freitas, and Buhrnheim, 1967 (Digenea: Cryptogonimidae) in estuarine fishes from the Gulf of Mexico. Proc. Helmin. Soc. Wash. 38(2): 156-158. (Miss. 2-85-R) COM-72-10074

1971. Glaucivermis spinosus Gen. Et. Sp. N. (Digenea: Zoogonidae) from the southern kingfish, Menticirrhus americanus (Linnaeus), in the coastal waters of Mississippi. J. Parasitol. 57(3): 536-538. (Miss. 2-85-R) COM-73-10848

OVERSTREET, ROBIN M., and CHARLES E. BROWN
1970. Lasiotocus tranchinoti sp. N. (Digenea: Monorchiidae) from the pompano Trachinotus carolinus (Linnaeus), along the east coast of Florida. J. Parasitol. 56(5): 941-943. (Miss. 2-85-R) COM-72-10075

OVERSTREET, ROBIN M., and DAVID W. COOK
1972. An underexploited Gulf Coast fishery--soft shelled crabbing. Amer. Fish Farmer 3(9): 12-17. (Miss. 2-85-R) COM-73-10048

OVERSTREET, ROBIN M., and HARRIET M. PERRY
1972. A new microphallid trematode from the blue crab in the northern Gulf of Mexico. Trans. Amer. Microsc. Soc. 91(3): 436-440. (Miss. 2-85-R and 2-123-R)

OWEN, JOHN B., and CHARLES WAHTOLA, JR.
1970. A preliminary report on age and growth of a black bullhead population under commercial exploitation in North Dakota. Univ. N. Dak., Contrib. Inst. Ecol. Studies 2, 12 pp. (N. Dak. 4-30-R) COM-72-11182

PADILLA, ROBERT
1972. Reproduction of carp, smallmouth buffalo, and river carpsucker in Elephant Butte Lake. M.S. thesis, New Mexico St. Univ., Las Cruces, N. Mex., 66 pp. (N. Mex. 6-11-R)

PAGE, JIMMY WAYNE
1972. Interactions of dietary levels of protein and energy on channel catfish (Ictalurus punctatus). M.S. thesis, Armstrong St. College, Athens, Ga., 37 pp. (Ga. 2-84-R)

PARKER, NEAL M.
1968. A sedimentologic study of Perdido Bay and adjacent offshore environments. M.S. thesis, Fla. St. Univ., Tallahassee, 57 pp. (Ala. 2-34-R) COM-72-10286

PARR, WILLIAM H., and PAUL C. PEDERSON
1969. Forecast of the sockeye salmon run to Chignik in 1969. Alaska Dep. Fish Game, Leafl. 132, 12 pp. (Alaska 5-6-R)

PARRACK, MICHAEL LARRY
1970. An analysis of three commercial harvest estimation procedures used in the Oklahoma commercial fishery. M.S. thesis, Okla. St. Univ., Stillwater, 58 pp. (Okla. 4-25-D) COM-72-10259

PARRISH, RICHARD H., and ERIC H. KNAGGS
1971. Revision of the age composition of the southern California catch of Pacific mackerel from the 1958-59 through 1963-64 seasons. Calif. Fish Game 57(3): 182-201. (Calif. 6-3-R)

1972. The southern California Pacific mackerel fishery and age composition of the catch for the 1964-65 through 1967-68 seasons. Calif. Fish Game 58(1): 13-21. (Calif. 6-3-R)

PERRET, WILLIAM S., BARNEY R. BARRETT, WALTER R. LATAPIE, JUDD F. POLLARD, WOODROW R. MOCK, GERALD B. ATKINS, WILSON J. GAIDRY, and CHARLES J. WHITE
1971. Cooperative Gulf of Mexico estuarine inventory and study, Louisiana: Phase I, Area Description, and Phase II, Biology. La. Wildl. Fish. Comm., 175 pp. (La. 2-22-R) COM-72-10051

PERRY, HARRIET MACGILL
1970. Seasonal and areal distribution and abundance of the copepods in a Mississippi estuarine system. M.S. thesis, Univ. S. Miss., Hattiesburg, 82 pp. (Miss. 2-25-R)

PERRY, JAMES ALLISON
1970. A study of the bottom fish population in the offshore waters of Mississippi by trawl survey. M.S. thesis, Univ. Miss., Oxford, 112 pp. (Miss 2-42-R) COM-72-11260

PETERSON, ALLEN E., JR.
1968. 1967 Massachusetts coastal lobster fishery statistics. Mass. Div. Mar. Sci., Tech. Ser. 3, 20 pp. (Mass. 3-37-R)

PETERSON, S.A.
1967. Depth distribution of goldeye, Hiodon alosides (Rafinesque) in Moccasin Bay on the Little Missouri Arm of Garrison Reservoir, North Dakota. M.S. thesis, Univ. N. Dak., Grand Forks. (N. Dak. 4-15-R)

PHILLIPS, PHILIP J., W. DAVID BURKE, and ELIZABETH J. KEENER
1969. Observations on the trophic significance of jellyfishes in Mississippi Sound with quantitative data on the associative behavior of small fishes with medusae. Trans. Amer. Fish. Soc. 98(4): 703-712. (Miss. JF-2-1)

PHINNEY, DUANE E., and MICHAEL L. DAHLBERG
1968. Chignik lakes and sockeye salmon studies. Univ. Wash., Fish. Res. Inst., Contrib. 280: 10-12. (Alaska AFC-13)

PIEHLER, G.R.
1967. Age and growth of the common whitefish, Coregonus clupeaformis, of Northern Lake Michigan and Bay De Noc areas. M.S. thesis, Mich. St. Univ., East Lansing. (Mich. 4-2-R) COM-72-10293

PINKAS, LEO, MALCOM S. OLIPHANT, and IGRID L.K. IVERSON
1971. Food habits of albacore, bluefin tuna, and bonito in California waters. Calif. Dep. Fish Game, Fish Bull. 152, 105 pp. (Calif. 6-7-R and 6-16-R)

PLUMB, JOHN ALFRED
1972. Some biological aspects of channel catfish virus disease. Ph.D. thesis, Auburn Univ., Auburn, Ala., 118 pp. (Tenn. 2-151-R) COM-72-11301

PRASHER, JANIS B., WILBUR M. TIDD, and RICHARD A. TAUB
1971. Techniques for extracting and quantitatively studying the spore stage of the protozoan parasite, Myxosoma cerebralis. Prog. Fish-Cult. 33(4): 193-196. (Ohio 4-68-R) COM-72-11231

PROCOPIO, MARY A.
1972. Massachusetts Fisheries--Curriculum Source Unit for Elementary Teachers. Salem St. Coll., Salem, Mass., p. 129. (Mass. 3-136-D) COM-73-10087

PURCELL, J.D., and ROBERT RAUNIKAR
1968. Analysis of demand for fish and shellfish. Univ. Ga. Agr. Exp. Sta., Res. Bull. 51, 37 pp. (Ga. 2-46-R) COM-72-10284

PURVIS, CONNELL E., and EDWARD G. MCCOY
1972. Overwintering pink shrimp, Penaeus duorarum, in Core and Pamlico Sounds, N.C. Econ. Res., Spec. Sci. Rep. 22, 29 pp. (N.C. 2-129-R) COM-72-11069

RAINS, JOSEPH H.
1971. Macrobenthic population dynamics in Indiana waters of Lake Michigan in 1970. M.S. thesis, Ball St. Univ., Muncie, 78 pp. (Ind. 4-43-R)

RAMUS, J.
1971. Codium: The invader. Discovery 6(2): 59-89. (Conn. JF-3-6) COM-72-10080

REED, PAUL H.
1969. Culture methods and effects of temperature and salinity on survival and growth of dungeness crab (Cancer magister) larvae in the laboratory. J. Fish. Res. Bd. Can. 26: 389-397. (Oreg. 1-5-R) COM-72-10041

REGAN, JAMES EUGENE
1970. Biological characteristics of a population of yellow perch Perca flavescens (Mitchell) in Lake Ashtabula, North Dakota, as sampled with an otter trawl. M.S. thesis, Univ. N. Dak., Grand Forks, 39 pp. (N. Dak. 4-30-R) COM-72-11176

RHODES, RAYMOND J.
1971. The food habits of the alewife in Indiana waters of Lake Michigan in 1970. M.S. thesis, Ball St. Univ., Muncie, 82 pp. (Ind. 4-43-R)

RINNE, JOHN NORMAN
1973. A limnological study of Central Arizona reservoirs with reference to horizontal fish distribution. Ph.D. thesis, Ariz. St. Univ., 350 pp. (Ariz. 6-11-R)

ROBINSON, JACK G.
1971. The distribution and abundance of pink shrimp, Pandalus jordani, off Oregon. Oreg. Fish Comm., Invest. Rep. 8, 48 pp. (Oreg. 1-3-R)

ROBINSON, JOHN W.
1970. The 1969 Upper Mississippi River dredge spoil survey. Upper Miss. River Conserv. Comm., 157 pp. (Mo. 4-3-R) COM-72-10044

ROSEN, A., and R.E. LEVIN
1970. Detection and incidence of Escherichia coli on storage pen surfaces on fishing trawlers. Appl. Microbiol. (June), 4 pp. (Mass. 3-35-R)

1970. Vibrios from fish pen slime which mimic E. coli on violet red bile agar. Appl. Microbiol. (June), 6 pp. (Mass. 3-35-R)

ROYS, ROBERT S.
1971. Effects of tectonic deformation on pink salmon runs in Prince William Sound. The Great Alaska Earthquake of 1964: Biology. Nat. Acad. Sci., Wash., D.C., pp. 220-237. COM-72-11407

RUSSELL, PHILIP A.
1972. Frazer Lake sockeye investigations, 1970. Alaska Dep. Fish Game, Inform. Leafl. No. 150, 83 pp. (Alaska AFC-8)

RYAN, JOHN J.
1969. A sedimentologic study of Mobile Bay, Alabama. Fla. St. Univ. Contrib. 30, 110 pp. (Ala. 2-34-R) COM-72-10295

SADOVSKI, A.Y., and R.E. LEVIN
1969. Extracellular nuclease activity of fish spoilage bacteria, fish pathogen, and related species. Appl. Microbiol. 17: 787-789. (Mass. 3-35-R)

SAKUDA, HENRY M.
1966. A modified plastic internal anchor tag. Prog. Fish-Cult. 28(3): 132. (Hawaii H-4-R)

1966. Condition of American oysters (Crassostrea virginica), in West Loch, Pearl Harbor, Hawaii. Trans. Amer. Fish. Soc. 95(4): 426-429. (Hawaii H-2-R)

1968. A rapid method of tagging fish. U.S. Fish Wildl. Serv., Fish. Bull. 66: 573. (Hawaii H-4-R) COM-72-10166

SANCHEZ, CHARLES, JR.
1970. Life history and ecology of carp, Cyprinus carpio, Linnaeus, in Elephant Butte Lake, New Mexico. M.S. thesis, N. Mex. St. Univ., State College, 65 pp. (N. Mex. 6-11-R) COM-72-10028

SAYLOR, MICHAEL L.
1971. Effect of harvesting methods on production of fingerling fathead minnows. M.S. thesis, Colo. St. Univ., Ft. Collins, 15 pp. (Colo. 6-11-D) COM-72-11179

SCHIEMER, E.W., and J.R. SCHUBEL
1971. An improved vehicle for towing a displacement type sound source for continuous seismic profiling. Mar. Geophy. Res. 1: 352-353 (Md. AFC-5)

1971. A poppet valve for the benthos gravity corer. Chesapeake Sci. 12(2): 116-118. (Md. AFC-4) COM-73-10126

SCHIEMER, E.W., J.R. SCHUBEL, and G.M. SCHMIDT
1971. A laboratory apparatus for maintaining uniform suspensions of fine-grained sediment. Chesapeake Bay Inst., Tech. Rep. 70, 9 pp. (Md. AFC-5) COM-72-11185

SCHOLL, RUSSELL L.
1968. A rapid decalcifying method for sectioning channel catfish pectoral fins. Trans. Amer. Fish. Soc. 97(2): 210-211. (Ohio 4-6-R) COM-72-11049

SCHRECK, CARL B.
1972. Reproductive endocrinology of fishes. Ph.D. thesis, Colo. St. Univ., Ft. Collins, 99 pp. (Colo. 6-11-D) COM-72-11325

SCHUBEL, J.R.
1968. Shore erosion of the northern Chesapeake Bay. Shore Beach, April 22-26. (Md. 3-30-R)

1968. Suspended sediment discharge of the Susquehanna River at Havre de Grace, Maryland. Chesapeake Sci. 9(2): 131-135. (Md. 3-30-R) COM-72-10400

1968. Suspended sediment of the northern Chesapeake Bay. Tech. Rep. 35, CBI-JHU, Ref. 68-2, March. (Md. 3-30-R)

1968. Turbidity maximum of the northern Chesapeake Bay. Science 161 (3845): 1013-1015. (Md. 3-30-R) COM-73-50446

1969. Distribution and transportation of suspended sediment in upper Chesapeake Bay. Chesapeake Bay Inst., Johns Hopkins Univ., Tech. Rep. 60, 29 pp. (Md. 3-30-R) COM-72-10387

1969. Size distributions of the suspended particles of the Chesapeake Bay turbidity maximum. Netherlands J. Sea Res. 4(3): 283-309. (Md. 3-30-R) COM-72-10399

1969. On suspended sediment sampling by filtration. Geol. Soc. Amer. 8(2): 85-87. (Md. 3-30-R)

1969. Transport of suspended sediment in the upper reaches of the Chesapeake Bay. Geol. Soc. Amer., SE Sec. Meeting. (Md. 3-30-R)

1970. Tidal variation of the suspended sediment size distribution at a station in upper Chesapeake Bay. Chesapeake Bay Inst., Johns Hopkins Univ., Tech. Rep. 63, 28 pp. (Md. 3-30-R) COM-72-10386

1971. Tidal variation of the size distribution of suspended sediment at a station in the Chesapeake Bay turbidity maximum. Netherlands J. Sea Res. 5(2): 252-266. (Md. AFC-4) COM-72-11375

SCHUBEL, J.R., and R.B. BIGGS
1969. Distribution of sediment in upper Chesapeake Bay. Chesapeake Sci. 10(1): 18-23. (Md. 3-30-R)

SCHUBEL, J.R., H.H. CARTER, E.W. SCHIEMER, and R.C. WHALEY
1972. A case study of littoral drift based on long-term patterns of erosion and deposition. Chesapeake Sci. 13(2): 80-86. (Md. AFC-4) COM-73-10020

SCHUBEL, J.R., CECILY H. MORROW, and W.B. CRONIN
1968. Suspended sediment data summary March 1966-May 1967 upper Chesapeake Bay (Tolchester to Harve de Grace). Chesapeake Bay Inst., Johns Hopkins Univ., Spec. Rep. 14, 60 pp. (Md. 3-30-R) COM-72-10398

SCHUBEL, J.R., C.H. MORROW, W.B. CRONIN, and A. MASON
1970. Suspended sediment data summary. Spec. Rep. 18, Chesapeake Bay Inst., 39 pp. (Md. AFC-4) COM-72-11184

SCHUBEL, J.R., and E.W. SCHIEMER
1969. A semiautomatic microscopic particle size analyzer utilizing the Vickers image splitting eyepiece. Sedimentology 9: 319-326. (Md. 3-30-R)

SCHUBEL, J.R., and C.F. ZABAWA
1972. A pleistocene Susquehanna River channel connects the lower reaches of the Chester, Miles, and Choptank Estuaries. Chesapeake Bay Inst., Johns Hopkins Univ., Spec. Rep. 24, 12 pp. (Md. AFC-5) COM-73-10025

SHRABLE, JOHN BERNARD
1969. Effects of temperature on rate of digestion by channel catfish, Ictalurus punctatus (Rafinesque). M.S. thesis, Kans. St. Univ., Manhattan, 69 pp. (Kans. 4-1-R) COM-72-10168

SHRABLE, J.B., O.W. TIEMEIER, and C.W. DEYOE
1969. Effects of temperature on rate of digestion by channel catfish. Prog. Fish-Cult. 31(3): 131-138. (Kans. 4-1-R) COM-72-11045

SISSON, RICHARD T.
1970. Occurrence of bay scallop seed in Rhode Island 1970. R.I. Div. Fish Wildl. Leafl. 32, 4 pp. (R.I. 3-113-R)

SMEDLEY, S.C., and MELVIN C. SEIBLE
1967. Forecast of 1967 pink salmon runs in southeastern Alaska. Alaska Dep. Fish Game, Leafl. 102, 15 pp. (Alaska AFC-14)

SMEDLEY, S.C., KENNETH E. DURLEY, and MICHAEL J. MCHUGH
1968. Forecast of 1968 pink salmon runs southeastern Alaska. Alaska Dep. Fish Game. Leafl. 118, 17 pp. (Alaska AFC-14)

SPALL, R.D.
1968. Occurrence and distribution of helminth parasites of fishes from Lake Carl Blackwell, Oklahoma. M.S. thesis, Okla. St. Univ., Stillwater. (Okla. 4-24-R)

SPALL, RICHARD D., and ROBERT C. SUMMERFELT
1969. Host-parasite relations of certain endoparasitic helminths of the channel catfish and white crappie in an Oklahoma reservoir. Bull. Wildl. Dis. Assoc. 5: 48-67. (Okla. 4-24-R) COM-72-10032

STARRETT, WILLIAM C.
1971. A survey of the mussels (UNIONACEA) of the Illinois River: A polluted stream. Ill. Nat. Hist. Surv. Bull. 30, Art. 5: 267-403, Urbana, Ill. (Ill. 4-13-R)

STEWART, DONALD M.
1967. 1966 Bristol Bay red salmon smolt studies. Alaska Dep. Fish Game, Leafl. 102, 52 pp. (Alaska 5-5-R) COM-73-10698

1969. 1967 Bristol Bay red salmon smolt studies. Alaska Dep. Fish Game, Leafl. 134, 69 pp. (Alaska 5-5-R) COM-73-10755

STICKNEY, ROBERT R., and JAMES W. ANDREWS
1971. The influence of photoperiod on growth and food conversion of channel catfish. Prog. Fish-Cult. 33(4): 204-205. (Ga. 2-84-R) COM-72-10912

STOKES, R.J., E.A. JOYCE, JR., and R.M. INGLE
1968. Initial observation on a new fishery for the sunray venus clam, Macrocollista nimbosa (Solander). Fla. Bd. Conserv., Mar. Res. Lab., Tech. Ser. 56, 27 pp. (Fla. 2-53-R) COM-72-11270

STONE, JOHN H., JOSEPH W. BURNETT, and RONALD GOLDNER
1970. The amino acid content of sea nettle (Chrysaora quinquecirrha) nematocysts. Comp. Biochem. Physiol. 33: 707-710. (Md. JF-3-1) COM-72-11183

STRAND, R.F., and W.J. SCIDMORE
1969. Sonar--an aid to under ice rough fish seining. Minn. Dep. Conserv. Spec. Publ. 68, 35 pp. (Minn. 4-22-D) COM-72-11063

STUDEBAKER, JOHN P.
1972. Development of the cubomedusa, Carybdea marsupiolis. M.S. thesis, Univ. P.R., Mayaguez, 60 pp. (P.R. JF-2-6) COM-73-10808

SUAREZ-CAABRO, JOSE A.
1970. Puerto Rico's commercial marine fisheries--a statistical picture. Commer. Fish. Rev. 32: 31-36. (P.R. 2-56-R) COM-72-10064

SUBRAHMANYAM, CHEBIUM B.
1969. The relative abundance and distribution of penaeid shrimp larvae off the Mississippi coast. Ph.D. thesis, Miss. St. Univ., State College, 106 pp. (Miss. 2-42-R)

SUMMERFELT, ROBERT C., PAUL E. MAUCK, and GARY MENSINGER
1970. Food habits of the carp, Cyprinus carpio L., in five Oklahoma reservoirs. SE Assoc. Game Fish Comm., Proc. 24th Ann. Conf., pp. 352-377. (Okla. 4-24-R) COM-72-10382

SUPPES, V.C.
1967. Selection, growth rates and seasonal variation of protein and lipids in channel catfish Ictalurus punctatus (Rafinesque). M.S. thesis, Kans. St. Univ., Manhattan (Kans. 4-1-R)

SUPPES, C., O.W. TIEMEIER, and C.W. DEYOE
1967. Seasonal variations of fat, protein, and moisture in channel catfish. Trans. Kans. Acad. Sci. 70(3): 349-358. (Kans. 4-1-R) COM-72-11046

SUTTON, J.S., and J.W. BURNETT
1969. A light and electron microscopic study of nematocytes of Chrysaora quinquecirrha. J. Ultrastructural Res. 28: 214-234. (Md. JF-3-1) COM-72-10395

1969. Ultrastructural changes in dermal and epidermal cells of skin infected with molluscum contagiosum virus. J. Ultrastructural Res. 26: 177-196. (Md. JF-3-1)

SUTTOR, RICHARD E.
1968. Seafood processing in the Chesapeake Bay area. Univ. Md., Ext. Ser. Rep. 14: 3-9. (Md. 3-42-D)

SUTTOR, RICHARD E., and PARVIZ ARYAN-NEJAD
1969. Demand for shellfish in the United States. Univ. Md., Agr. Exp. Sta., Misc. Publ. 695, 28 pp. (Md. 3-42-D) COM-72-10393

SUTTOR, RICHARD E., and THOMAS D. CORRIGAN
1969. Economic efforts of regulations in Maryland oyster fishery. Commer. Fish. Rev. 38-41. (Md. 3-42-D)

SUTTOR, RICHARD E., and ROBERT H. WUHRMAN
1968. Employment in the Maryland-Virginia seafood processing industry. Agr. Exp. Sta., College Park, Md., 14 pp. (Md. 3-42-D) COM-72-10392

1968. The commercial fishing and seafood processing industries of the Chesapeake Bay area. Md. Agr. Exp. Sta. Publ. 676, Contrib. 4077, 81 pp. (Md. 3-42-D) COM-72-10385

SWIFT, D.J.P., J.R. SCHUBEL, and R.E. SHELDON.
1972. Size analysis of fine-grained suspended sediments: a review. J. Sediment. Petrol. 42(1): 122-134. (Md. 3-30-R) COM-73-10725

SWINGLE, HUGH A.
1971. Biology of Alabama estuarine areas - cooperative Gulf of Mexico estuarine inventory. Ala. Mar. Res. Bull. 5, 123 pp. (Ala. 2-34-R) COM-72-10265

1972. Survey of the live bait shrimp industry of Alabama. Ala. Mar. Res. Bull. 8, pp. 1-8. (Ala. 2-83-R) COM-72-11149

SWINGLE, HUGH A., ARTHUR E. DAMMANN, and JOHN A. YNTEMA
1970. Survey of the commercial fishery of the Virgin Islands of the United States. Proc. 22d Ann. Ses. Gulf Carib. Fish Inst., pp. 110-121. (V.I. 2-33-R)

SYLVESTER, J.R., and A.E. DAMMANN
1972. Pot fishing in the Virgin Islands. U.S. Nat. Mar. Fish. Serv., Mar. Fish. Rev. 34(9-10): 33-35. (V.I. 2-121-R)

TAFANELLI, R., P.E. MAUCK, and G. MENSINGER
1970. Food habits of bigmouth and smallmouth buffalo from four Oklahoma reservoirs. SE Assoc. Game Fish Comm., Proc. 24th Ann. Conf., pp. 649-658. (Okla. 4-24-R) COM-72-10381

TAO, SHIH-KUO
1970. Investigations of the use of gonadotrophins to induce spawning in the white sucker Catostomus commersoni (Lacepede), North Dakota. M.S. thesis, N. Dak. Univ., Grand Forks, 29 pp. (N. Dak. 4-54-R) COM-72-10049

TARVER, JOHNNIE W.
1972. Occurrence, distribution and density of Rangia cuneata in Lakes Pontchartrain and Maurepas, Louisiana. La. Wildl. Fish. Comm., Tech. Bull. 1, 8 pp. (La. 2-91-R)

THORNE, RICHARD E., JERRY E. REEVES, and ALAN E. MILLIKAN
1971. Estimation of the Pacific hake (Merluccius productus) population in Port Susan, Washington, using an echo integrator. J. Fish Res. Bd. Can. 28: 1275-1284. (Wash. 1-71-R) COM-72-11079

TIEMEIER, O.W., and C.W. DEYOE
1968. A review of techniques used to hatch and rear channel catfish in Kansas and proposed restrictions on nutritional requirements of fingerlings. Trans. Kans. Acad. Sci. 71(4): 491-503. (Kans. 4-1-R) COM-72-11050

1968. Production of channel catfish. Bull. 508, Agr. Exp. Sta., Kans. St. Univ., Manhattan, 24 pp. (Kans. 2-1-R) COM-72-10048

TIEMEIER, O.W., C.W. DEYOE, A.D. DAYTON, and J.R. SHRABLE
1969. Rations containing four protein sources compared at low protein levels and two feeding rates with fingerling channel catfish. Prog. Fish-Cult. 31: 79-89. (Kans. 4-45-R) COM-72-10185

TIEMEIER, OTTO W., C.W. DEYOE, and RALPH LIPPER
1970. Influence of photoperiod on growth of fed channel catfish (Ictalurus punctatus) in early spring and late fall. Trans. Kans. Acad. Sci. 72(4): 519-522 (Kans. 4-45-R)

TURNER, PAUL R., and ROBERT C. SUMMERFELT
1970. Food habits of adult flathead catfish, Pylodictis olivaris (Rafinesque), in Oklahoma reservoirs. SE Assoc. Game Fish Comm., Proc. 24th Ann. Conf., pp. 387-401. (Okla. 4-24-R) COM-72-10914

TRZPUC, DARRELL JOHN
1972. The biology and ecology of river carpsucker, Carpiodes carpio (Rafinesque), in the Little Missouri Arm of Lake Sakakawea, North Dakota. M.S. thesis, Univ. N. Dak., 40 pp. (N. Dak. 4-69-R)

VAUGHN, THOMAS L.
1967. Fecundity of the American shad in the Altamaha River system. Ga. Game Fish Contrib. 3, 9 pp. (Ga. AFC-1) COM-72-10190

VOGEL, M., and L.P. SCHULTZ
1970. Cargoa cupella, new genus and new species of nudibranch from Chesapeake Bay. Veliger 12(4): 388-393. (Md. JF-3-1) COM-72-10371

VOGEL, ROSALIE M.
1971. The biology and a rediscription of the opisthobranch mollusk Hermaea cruciata Gould, from Chesapeake Bay (Sacoglossa: Hermaeidae). Veliger 14(2): 155-157. (Md. JF-3-7) COM-73-10051

WAHTOLA, CHARLES H., JR.
1969. The age, rate of growth and ecological distribution of channel catfish, Ictalurus punctatus (Rafinesque), in the Little Missouri Arm of Lake Sakakawea, North Dakota. M.S. thesis, Univ. N. Dak., Grand Forks, 46 pp. (N. Dak. 4-15-R)

1971. The population dynamics of channel catfish, Ictalurus punctatus (Rafinesque), in the Little Missouri Arm of Lake Sakakawea, before and during commercial exploitation, 1968-1971. Ph.D. thesis. Univ. N. Dak., Grand Forks, N. Dak. 126 pp. (N. Dak. 4-69-R) COM-72-11066

WEBB, N.B., and F.B. THOMAS
1968. An investigation of methods for the improvement of the quality and yield of scallop meat during processing. N.C. Dep. Conserv. Develop., Spec. Sci. Rep. 16, 83 pp. (N.C. 2-8-R) COM-73-10797

WEBB, N.B., F.B. THOMAS, F.F. BUSTA, and L.S. KERR
1972. Evaluation of scallop meat quality by the resazurin deduction technique. J. Milk Food Tech. 35(11): 664-668. (N.C. 2-100-R) COM-73-10445

WEBB, N.B., F.B. THOMAS, F.F. BUSTA, and R.J. MOORE
1967. A study of the quality of North Carolina scallops - an investigation of methods for the improvement of the quality and yield of scallop meat during processing. N.C. Dep. Conserv. Develop., Spec. Sci. Rep. 12, 63 pp. (N.C. 2-8-R) COM-72-10496

WERNER, BERNHARD, CHARLES E. CUTRESS, and JOHN P. STUDEBAKER
1971. Life cycle of Tripedalia cystophora Conant (cubomedusa). Nature 232(5312): 582-583. (P.R. JF-2-6)

WILLIAMS, AUSTIN B.
1971. A ten-year study of meroplankton in North Carolina estuaries: annual occurrence of some brachyuran developmental stages. Chesapeake Sci. 12(2): 53-61. (N.C. 2-9-R) COM-72-10500

WILLIAMS, AUSTIN B., and KENNETH H. BYNUM
1972. A ten-year study of meroplankton in North Carolina estuaries: amphipods. Chesapeake Sci. 13(3): 175-192. (N.C. 2-9-R) COM-73-10246

WILLIAMS, AUSTIN B., and EARL E. DEUBLER
1968. A ten-year study of meroplankton in North Carolina estuaries: assessment of environmental factors and sampling success among bothid flounders and penaeid shrimp. Chesapeake Sci. 9(1): 27-41. (N.C. 2-9-R)

WOFFARD, G.E.
1968. Evaluation of fresh-water whole fish meal as a protein supplement for growing-finishing swine. M.S. thesis, Univ. Tenn., Knoxville, 36 pp. (Tenn. 4-31-R)

WOFFARD, G.E., S.A. GRIFFIN, E.R. LIDVALL, and M.R. JOHNSTON
1968. Kentucky Lake whole-fish meal as a protein supplement for growing-finishing swine. Tenn. Farm Home Sci., July, pp. 14-15. (Tenn. 4-31-R)

WOLF, MAURY
1972. A study of North Carolina scrap fishery. N.C. Dep. Nat. Econ. Res., Spec. Sci. Rep. 20, 29 pp. (N.C. 2-95-R) COM-72-10918

WRIGHT, K.J.
1968. Feeding habits of immature lake trout (Salvelinus namaycush) in the Michigan waters of Lake Michigan. M.S. thesis, Mich. St. Univ., East Lansing. (Mich. 4-2-R) COM-72-10282

ADMINISTRATIVE ORGANIZATIONS

COOPERATORS

State and Others	Agency	Address
Alabama	Department of Conservation and Natural Resources	64 North Union Street Montgomery 36104
	Auburn University	Auburn 36830
American Samoa	Office of Marine Resources Government of American Samoa	Pago Pago 96920
Alaska	Department of Fish & Game	Subport Building Juneau 99801
Arizona	Game & Fish Department	2222 West Greenway Phoenix 85023
Arkansas	Game & Fish Commission	Game & Fish Commission Bldg. Little Rock 72201
California	Department of Fish & Game The Resources Agency	1416 Ninth Street Sacramento 95814
Colorado	Division of Game, Fish & Parks Department of Natural Resources	6060 Broadway Denver 80216
Connecticut	Essex Marine Laboratory, Inc.	Essex 06426
	Department of Environmental Protection	State Office Building Hartford 06115
Delaware	Department of Natural Resources & Environmental Control	Dover 19901
Florida	Department of Natural Resources	Larson Building Gaines Street at Monroe Tallahassee 32304
Georgia	Department of Natural Resources	270 Washington Street, S.W. Atlanta 30334
Guam	Government of Guam	Agana 96910
Hawaii	Division of Fish & Game Department of Land & Natural Resources	530 South Hotel Street Honolulu 96813
Idaho	Fish & Game Department	600 South Walnut, Box 25 Boise 83707
Illinois	Department of Conservation	102 State Office Building Springfield 62706
Indiana	Division of Fish & Wildlife Department of Natural Resources	607 State Office Building Indianapolis 46204
Iowa	State Conservation Commission	State Office Building 300 Fourth Street Des Moines 50319

COOPERATORS CONTINUED

State and Others	Agency	Address
Kansas	Forestry, Fish & Game Commission	Box 1028, Pratt 67124
Kentucky	Department of Fish & Wildlife Resources	Capital Plaza Tower, 4th Floor Frankfort 40601
Louisiana	Wild Life and Fisheries Commission	400 Royal Street New Orleans 70130
Maine	Department of Sea & Shore Fisheries	State House Annex Augusta 04330
Maryland	Department of Natural Resources	Tawes State Office Building Annapolis 21401
Massachusetts	Department of Natural Resources	Leverett Saltonstall Bldg. 100 Cambridge Street Boston 02202
Michigan	Department of Natural Resources	Mason Building Lansing 48926
Minnesota	Division of Game & Fish Department of Natural Resources	301 Centennial Building 658 Cedar Street St. Paul 55101
Mississippi	Marine Conservation Commission	122 East Jackson Street Biloxi 39520
Missouri	Department of Conservation	P.O. Box 180 Jefferson City 65101
Montana	Fish & Game Department	Helena 59601
Nebraska	Game & Parks Commission	2200 North 33rd St. Lincoln 68503
Nevada	Department of Fish & Game	Box 10678 Reno 89510
New Hampshire	Fish & Game Department	34 Bridge Street Concord 03301
New Jersey	Department of Environmental Protection	Labor & Industry Building Box 1390 Trenton 08625
New Mexico	Department of Game & Fish	State Capitol Santa Fe 87501
New York	Division of Marine and Coastal Resources Department of Environmental Conservation	Building 40, State University of New York Stony Brook 11790
North Carolina	Division of Commercial & Sports Fisheries Department of Natural and Economic Resources	P.O. Box 27687 Raleigh 27611
North Dakota	State Game & Fish Department	2121 Lovett Street Bismarck 58501

COOPERATORS CONTINUED

State and Others	Agency	Address
Ohio	Division of Wildlife Department of Natural Resources	1500 Dublin Road Columbus 43212
Oklahoma	Department of Wildlife Conservation	1801 North Lincoln Oklahoma City 73105
Oregon	Fish Commission	307 State Office Building Portland 97201
	Pacific Salmon Inter-agency Council	741 State Office Building Portland 97201
	Oregon State University	Corvallis 97331
Pennsylvania	Fish Commission	P.O. Box 1673 Harrisburg 17120
Puerto Rico	Department of Agriculture	Box 10163 Santurce, San Juan 00908
Rhode Island	Division of Fish and Wildlife Department of Natural Resources	83 Park Street Providence 02903
South Carolina	Wildlife Resources Department	1015 Main Street, Box 167 Columbia 29202
South Dakota	Department of Game, Fish & Parks	State Office Building No.1 Pierre 57501
Tennessee	Game & Fish Commission	P.O. Box 40747 Ellington Agricultural Center, Nashville 37220
Texas	Parks & Wildlife Department	John H. Reagan Building Austin 78701
Utah	Fish & Game Division State Department of Natural Resources	1596 West North Temple Salt Lake City 84116
Vermont	Fish & Game Department	151 Main Street Montpelier 05602
Virgin Islands	Department of Conservation & Cultural Affairs	Charlotte Amalie, St. Thomas 00801
Virginia	Marine Resources Commission	P.O. Box 756 Newport News 23607
	Institute of Marine Science	Gloucester Point 23062
Washington	Department of Fisheries	115 General Administration Building, Olympia 98501
	Fisheries Research Institute	University of Washington Seattle 98105
West Virginia	Department of Natural Resources	1800 Washington St., East Charleston 25305
Wisconsin	Department of Natural Resources	Box 450, Madison 53701
Wyoming	Game & Fish Commission	Box 1589, Cheyenne 82001

NATIONAL MARINE FISHERIES SERVICE

Region 1

Colorado
Idaho
Montana
North Dakota
Oregon
South Dakota
Utah
Washington
Wyoming

Donald R. Johnson, Director
John T. Gharrett, Special Assistant
to the Regional Director
1700 Westlake Avenue North
Seattle, Washington 98109
Phone: 206-442-1460

Region 2

Alabama
Arkansas
Florida
Georgia
Iowa
Kansas
Kentucky
Louisiana
Mississippi
Missouri
Nebraska
New Mexico
North Carolina
Oklahoma
Puerto Rico
South Carolina
Tennessee
Texas
Virgin Islands

Jack W. Gehringer, Director
I.B. Byrd, Chief, State-Federal
Relationships Division
Duval Building
9450 Gandy Boulevard
St. Petersburg, Florida 33702
Phone: 813-893-3162

Region 3

Connecticut
Delaware
Illinois
Indiana
Maine
Maryland
Massachusetts
Michigan
Minnesota
New Hampshire
New Jersey
New York
Ohio
Pennsylvania
Rhode Island
Vermont
Virginia
West Virginia
Wisconsin

Russell T. Norris, Director
William R. Beckmann, Chief,
Federal Relationships Division
Federal Building
14 Elm Street
Gloucester, Massachusetts 01930
Phone: 617-283-6554

Region 4

American Samoa
Arizona
California
Guam
Hawaii
Nevada

Gerald V. Howard, Director
Frederick K. Cramer, Resource
Management Administrator
300 South Ferry Street
Terminal Island, California 90731
Phone: 213-831-9575

Region 5

Alaska

Harry L. Rietze, Director
Robert Simon, Chief, State-Federal
Relationships Division
P.O. Box 1668
Juneau, Alaska 99801
Phone: 907-586-7222

☆ U. S. GOVERNMENT PRINTING OFFICE : 1973 542-648/32